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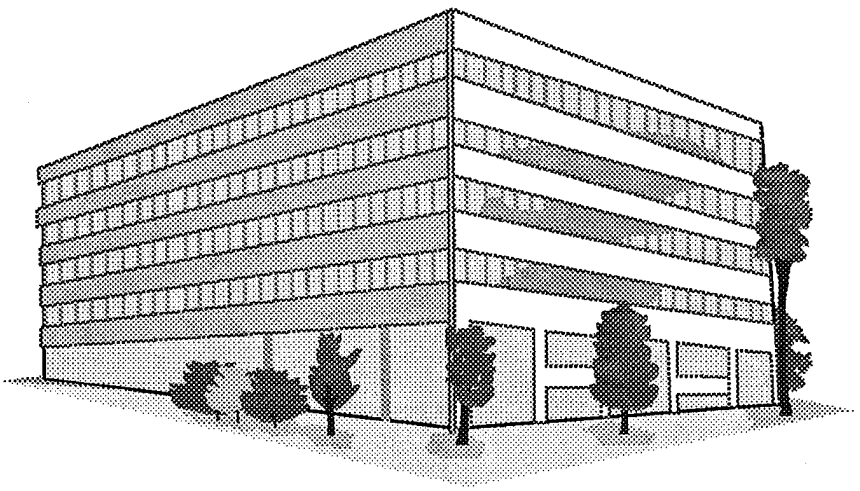
Alternative Delivery Approaches For Military Medical Construction Projects



A Paper Submitted To
The Faculty of the M.E. Rinker, Sr., School of Building Construction
In Candidacy for the Degree of
Master of Building Construction

By
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Gainesville, Florida
April 1996

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ABSTRACT

The purpose of this report is to illustrate how the use of alternative project delivery methods (specifically Construction Management and Design/Build) and alternative contracting methods (such as cost-plus-fee contracts and negotiated contracts) can reduce the amount of time it takes to design and build a new military medical facility, as well as reduce the overall cost of the project. The advantages offered by these alternative delivery and contracting methods are set forth, and their applicability within the federal procurement process is discussed. Several recommendations are then given for using these methods for the design and construction of military medical facilities.

Introduction

Military medical construction projects take approximately eleven years to complete, from the time the need for a new facility is identified until the building actually opens for occupancy. This time is often extended even further due to complications during the design and construction process. Furthermore, these projects often are completed well over their original budget. Although there are many reasons for this exorbitant amount of time, and many causes for the budgetary problems, one of the major factors is the reliance on the traditional methods of a lump-sum contract and the design-bid-build project delivery approach. The purpose of this report is to illustrate how the use of alternative project delivery and contracting methods can significantly reduce the amount of time it takes to bring a new facility on-line, as well as preclude many of the problems that lead to cost overruns.

Chapter One of this report presents the problem: the fact that military medical construction projects take too long. The implications of this problematic system are explored, and several examples of actual projects are discussed.

Chapter Two is a detailed discussion of the current procurement process for military medical facilities. Furthermore, the problems that arise due to this process, specifically for medical projects, are examined.

Chapter Three presents two alternative delivery approaches available: construction management and design/build. Each approach is described in detail, and the advantages of

each are set forth. Also, examples of civilian medical projects using each of these methods are presented. Finally, the specific advantages of construction management and design/build for military medical projects are discussed.

Chapter Four explores alternative contracting methods. Specifically, cost-plus-fee and negotiated contracts are examined. A discussion of privatization is included as well. The advantages of each are presented, and the appropriateness of contract type to delivery method is discussed.

Chapter Five is a discussion of the Federal Acquisition Regulation and its effects on the way military medical projects are procured. The requirements of the regulation are dissected in order to determine its underlying intent. It is then shown how the regulation's intent can be met through the use of alternative delivery approaches.

Chapter Six opens with several recommendations as to how to best utilize alternative delivery approaches for military medical construction projects. A summary of the advantages of alternative delivery approaches when compared directly to the traditional design-bid-build process is then presented. Following this are several examples of the use of design/build in other areas of the public sector. The chapter closes with a few concluding thoughts.

The appendices provided at the end of the report include a detailed discussion of the current planning/programming process for military medical projects; a sample project timeline; a detailed description of construction management services; and a summary of the requirements of the Federal Acquisition Regulation.

Currently all military medical projects are procured using the traditional methods. It is the author's intent that this report, by showing the advantages of alternative project delivery and contracting methods, will initiate discussion among the decision-makers regarding their use. If these non-traditional approaches can be utilized on military medical projects, taxpayer dollars would be saved; military medical personnel would not have to wait so long to occupy new facilities; and patient care would improve for military members and their dependents, thereby improving the readiness of the military as a whole.

It is hoped that this report will act as the catalyst to initiate the change that is so desperately needed in the procurement process of military medical facilities.

CHAPTER 1

The Problem

The goal of all legitimate construction projects is to deliver a quality project, on time and under budget. There are many factors in the design and construction process, however, that can hinder or prevent the attainment of this goal. The size of the project; the complexity of the project; the abilities of those involved in the process; the number of agencies and participants involved in the process; the various codes and regulations that must be adhered to; the funding process; and even the weather can all have a significant impact on quality, cost, and schedule. Many of these factors come into play when the discussion turns to the design and construction of military medical facilities. In terms of complexity, there are few, if any, building types more complex than medical facilities. Furthermore, federal projects are notorious for the large number of agencies and participants involved (see Chapter Two). The extensive number of codes, directives, and regulations that must be followed, for both medical facilities and federal projects, is enormous when considered simultaneously. And, of course, the funding process for federal projects could be the subject of a lengthy paper in and of itself. It is of little surprise, then, when an accusation is made that most military medical projects take too long.

Just how long is "too long?" On average, from the time the need for a new facility is identified to the time a new building is actually occupied, is currently eleven years. And that is if everything goes according to schedule, which it usually does not. Problems

encountered during construction often extend this period several more years. It takes little imagination to see why this could be a problem. There are numerous reasons why this excessive amount of time is problematic.

FACTORS INVOLVED

Consider the planning of a new facility. Data are gathered based on current figures for workload, patient population and catchment area (the geographic area served by the facility), staffing, and the support services available in the local area. All of these factors can change dramatically in the course of eleven years. This fact is amplified by the nature of the military. Buildups, drawdowns, base realignment and closures, and unit rotations make for an ever-changing demographic landscape. And although planning figures are forecasted for the date of completion of a new project, all of the above-mentioned factors make this a guessing game at best. And since the majority of projects are not completed on time anyway, even if this data was accurate for the scheduled completion, it may not be accurate at the time of actual completion. Many facilities are opened that are either under or oversized based on their current requirements.

The pace of medical technology must also be considered. The advances made in medicine, medical procedures, and equipment are occurring at a faster rate today than at any time in history. Advances in medical science have created new diagnostic and treatment technology not dreamed of a few years ago. Fetal monitoring, diagnostic radioisotope procedures, computed tomography, magnetic resonance imaging, lithotripsy, open heart surgery, organ transplants, laser and microscope surgery, radiation therapy,

renal dialysis, and other complicated procedures require expensive equipment, expensive facilities, and skilled personnel.[1] The medical facility must respond to these new advancements at an equal pace if it is to be a responsive arena for effective patient care. Take, for example, the advances made in the field of radiology in the past several years. Computer-aided tomography (CAT) and magnetic resonance imaging (MRI) are technologies that have come into widespread use only in the recent past. The equipment and operating procedures associated with these technologies have driven the need for unique space requirements that do not exist in most military hospitals. This is why many CAT scan units are located in self-contained trailers in the parking lot next to the facility. This is not the ideal environment for patient-sensitive care. Nonetheless, medical staffs must operate in these environments for long periods of time until new facilities are built. When a project for a new facility takes an excessive amount of time, equipment technology can evolve faster than the building, resulting in a "new" facility, designed around obsolete equipment, that must then be retrofitted to accept the latest technologies.

The way medicine is practiced is also constantly evolving, and this too can affect the medical facility. For example, the emergence of Family Practice in the mid 1980s drove the requirement for new spatial relationships in outpatient clinics. At the time this was occurring, there was an addition/alteration project taking place at the clinic at Castle Air Force Base (AFB), California. However, the clinic was designed before Family Practice was adopted, and therefore did not contain a "Family Practice" clinic. By the time the project was completed, Family Practice had been adopted by the Air Force. The end result was that the staff ended up with a new facility that did not meet their space

requirements on the day it opened. Once again, the severity of the problem can be increased in the military. Missions are constantly added or taken away from medical units, changing their spatial requirements in the process.

Along with medical technology, building technology is also constantly evolving. New materials and new ways of working are continually being developed. The products available today may not be available in a few years. Quite often, a material that was specified during the design is not available during construction. Sometimes this cannot be avoided, but the problem worsens when the design and/or construction process is delayed. As in the example of medical equipment, a new facility may be opened with systems that have already been superseded by superior products.

Building systems and equipment also face the dilemma of their warranties expiring before the building is even complete. This can be avoided if all contracts specify the warranty start dates to coincide with building completion. Manufacturers, however, are sometimes reluctant to do this. Subsequently, most warranties on military medical projects begin from the time the item is delivered to the site. Many projects have been completed with various system and equipment warranties expired, and when this happens, the warranty is useless to the occupants of the facility.

A major problem with the excessive project delivery time has to do with money. The longer a project takes, the more it costs. This is due in part to the fact that the longer a contractor is on site, the more overhead expenses are incurred. Of course, the total amount of money that can be spent on a federal project is mandated by Congress. But many projects that start off with an estimated cost well below the mandated amount end

up spending every last dollar. The time value of money must also be considered. A dollar today may not be worth as much as a dollar a year from today, and the longer a project takes, the more we have to deal with inflation. This poses special problems for projects that are authorized at a given dollar value for a certain fiscal year. If the project extends beyond its original schedule, you are forced to try and fulfill the project's requirements with money that is worth less and less with the passage of time. This means either reducing requirements or sacrificing quality. This is a major problem in some overseas locations where inflation is not as stable as it is in the United States.

The most significant impact, however, of the lengthy military medical facility procurement process involves the basic needs of the patients receiving care in the facility, and of the medical staff that must practice there. The patients, which consist of all active-duty military, their dependents, and military retirees, deserve the highest standard of care possible in the finest environment possible. The doctors, nurses, and technicians in the military are as highly trained as their civilian counterparts and deserve to practice in state-of-the-art facilities. Many military hospitals and clinics are thirty or forty years old. For example, 43.5% of all Air Force medical facilities (by gross square footage) are over thirty years old. This is true for overseas as well as stateside facilities (33% of overseas facilities and 45% of stateside facilities are over thirty years old).[2] Many of these buildings are deteriorating, unsafe, and not conducive to the practice of medicine. While there are many newer facilities, the fact is that a building has to be in either extremely poor condition or be grossly undersized for its mission to warrant a new facility. By this time, there is already a desperate need for new or expanded space, but it could be another

eleven years before any is provided! In the meantime, the staff and patients must continue to cope with the existing facilities. The only recourse for the hospital commander is to submit requests for as many operation and maintenance (O & M) type projects as possible. This results in dysfunctional buildings with "wings" sprawling out in all directions, or modular type buildings being attached to the main facility. These "patch jobs" are merely temporary solutions to an ever-compounding problem.

When speaking of the needs of the people, the mission of the military must also be addressed. In order to carry out the overall mission of the military and to maintain a combat ready force, servicemembers must be healthy. It is the mission of the various medical services of the Department of Defense (DoD) to maintain the health of the servicemember. This mission is made more difficult when the facilities used to deliver healthcare are substandard. The lengthy process of military medical projects detracts from the mission by 1) forcing servicemembers to tolerate substandard facilities much longer than is necessary, which can have a direct affect on morale; 2) providing facilities that are not "state-of-the-art" when they are opened; and 3) hindering the efforts to provide the highest level of care to the patient, all of which create in and of themselves an undesirable situation.

EXAMPLES OF MILITARY MEDICAL PROJECTS

Table 1.1 lists some examples of military medical projects and the length of time it took to bring the facilities on line. It is important to note that there are many stages in the

PROJECT	SCOPE (SF)	PLANNING BEGAN*	DESIGN BEGAN	CONSTRUCTION BEGAN	ORIGINALLY SCHEDULED COMPLETION	ACTUAL COMPLETION	ORIGINAL CONTRACT AMOUNT	FINAL CONTRACT AMOUNT
Wright-Patterson CMF/DC Add/Alt	657,000	1975	1976	1982	1989	1990	108,560,554	122,800,456
Incirlik AB CMF/DC Replacement	117,500	1985	1986	1989	1992	1994	13,558,257	18,839,999
Ellsworth AFB CMF-Add/Alt DC Rpmt	112,500	1977	1978	1980	1982	1986	11,939,934	12,528,833
Carswell AFB CMF Add/Alt-DC Rpmt	360,300	1980	1981	1983	1985	1988	33,706,326	35,749,999
Aviano AB Clinic Replacement	32,800	1981	1982	1984	1990	1990	3,230,450	3,850,005
Osan AB CMF/DC Replacement	105,000	1980	1981	1983	1988	1987	21,745,533	21,745,539
Wurtsmith AFB CMF/DC Add/Alt	69,800	1978	1979	1981	1984	1986	9,332,285	10,554,743
Edwards AFB DC Replacement	16,900	1984	1985	1987	1989	1990	3,812,766	4,120,477

CMF- Composite Medical Facility
DC - Dental Clinic

* Indicates formal planning activities. Need identification occurs several years earlier.

TABLE 1.1: Example Projects [3,4]

procurement process of a project that can be delayed. This report, however, deals only with shortening the design and construction phases of that process. While significant amounts of time can be saved during design and construction through the use of alternative delivery methods, even more time could be saved in the areas of planning/programming (identifying the project and getting it into the program) and government red tape. This includes the many delays a project can face while working its way through the governmental bureaucracy, even before it gets to the design phase, as well as afterward. (The procurement process will be discussed in detail in Chapter Two.) Note also that although Table 1.1 lists only Air Force projects, this should not be construed to mean that only the Air Force has a problem. Medical construction is a DoD program, funded by the Defense Medical Facilities Office (DMFO), which falls under the Assistant Secretary of Defense for Health Affairs. Furthermore, the design and construction agent for all medical projects is either the U.S. Army Corps of Engineers (COE) or the Naval Facilities Engineering Command (NAVFAC). Whether the COE or NAVFAC is the agent is dependent upon geographic location, not branch of service. Therefore, both groups handle projects for every branch. The fact that Air Force projects are listed is due to the author's affiliation with that service and the availability of information in that regard.

Some of the projects listed in Table 1.1, as well as others, warrant discussion. The addition/alteration project at the Wright-Patterson AFB medical center in Ohio is a classic example of a military medical project burdened with delays. This was originally a fiscal year (FY) 1978 project. The fiscal year assigned to a project refers to the year the project

is scheduled to begin construction. Normally design begins two years prior to construction, which means specific planning for the facility (developing a Program for Design, equipment list, etc.) can begin a year or more before that. We will conservatively assume that the planning for this project began in 1975. The first hurdle encountered was the slippage of the project from FY78 to FY82. This could have happened for a number of reasons, all of which are beyond the scope of this report. When this happens, however, a host of other problems are created. During the four year slippage, many factors could have changed which would subsequently change the requirements of the project. A certain amount of redesign is then required, which creates additional costs. Construction finally began in October 1982 (which was actually in FY83). Construction was not completed until May 1989, six years and seven months after construction began, and approximately fourteen years after planning for the project was begun! Being a regional medical center, this facility is supposed to house the latest technologies, and act as a referral facility to accept cases from other medical facilities that do not have the same capabilities. The shortcomings of the facility were identified in the mid-seventies, but were not corrected until 1989. By that time, there were new shortcomings. And in the meantime, the facility had to try and fulfill its mission while a construction project was taking place all around them.

The hospital replacement at Incirlik Air Base (AB) in Turkey is a case of prolonged construction due to funding problems and change orders. Originally an FY88 project, design was begun in 1986. We will assume once again that planning began in 1985, one year earlier. Construction did not begin, however, until February of 1989. The

original contract completion date was January 2, 1992. A major stumbling block was encountered when the inflation rate in Turkey skyrocketed, causing the contractor to request additional funds from the U.S. government. This was a lengthy bureaucratic process which resulted in extremely slow progress on the project until the additional funds were approved. Along with the funds, the completion date was slipped to December 31, 1992. A second problem during construction was the excessive amount of change orders incorporated. Well over one hundred change requests were accomplished, resulting in eighteen contract modifications. The change requests encompassed the usual range of sources: user change requests; unforeseen conditions; errors and omissions by the designer; unavailability of specified products; etc. Construction was finally completed in May 1994, and due to the contract modifications, this was actually the final contract completion date, resulting in no liquidated damage charges. The facility was not occupied until October of 1994, due to delays in user contracts for computer systems and modular furniture. The medical staff at Incirlik AB watched the construction of their new facility for over five and one-half years, while they worked in a building which was falling apart around them. The existing hospital was a one-story masonry structure in the front, while the rear was composed of modular building components. The building's dysfunctional layout weaved in several directions. During rainstorms, it was necessary to navigate around the buckets that were placed in the corridors to catch the water from the roof leaks. And while the new facility would provide them with 117,500 square feet of space (the amount they were authorized based on their workload and staffing), they were

working at the time in a 58,000 square foot building. When these types of hardships are considered, it is apparent why every delay in the project delivery process becomes critical.

The staff at the medical and dental clinic at Hurlburt Field in Florida were working in a facility that was built in 1949. Planning for a replacement facility began in 1986. The design phase, which began in early 1987, went beyond the normal two years to December 1989. Construction began in October 1990, with an originally scheduled completion date of February 1992. The project was completed in August 1992. This was a $5 million project for a 35,000 square foot facility. A project of similar scope in the private sector would typically have been designed in less than a year and also built in less than a year. Yet, it took five and one-half years to design and build this facility to replace the existing clinic, which was used for forty-three years.

There are numerous other examples, even when we relegate ourselves to the construction phase. The FY80 hospital addition/alteration and dental clinic replacement at Ellsworth AFB, South Dakota was completed in May 1986, six years of construction for a 112,500 square foot, $11.8 million project. The FY81 hospital and dental clinic addition/alteration at Wurtsmith AFB, Michigan, a 69,800 SF, $12.6 million project, took five years to build. A 36,000 square foot, $8.8 million project at Comiso AB, Italy, took four years to build. It took five years to complete the $49 million addition/alteration at Carswell AFB, Texas. The new hospital at Osan AB, Korea, took four years to build a 105,000 square foot, $20.5 million facility. The FY84 clinic project at Aviano AB, Italy, a mere 32,800 square feet and $6.3 million, was not completed until June 1990. Three years were needed to complete a new dental clinic at Edwards AFB, California, a 16,900 square

foot, $3 million facility which was stripped of many of its features in order to award the project within the funding limitations. And the medical contingency complex at Base 54 (a classified location), a $14.2 million project which is composed of a series of warehouse style metal buildings, took five years to complete.

In the private sector, projects of similar scope to the ones mentioned above are routinely completed in much less time and at a lower cost. This is obviously due in part to the lack of bureaucratic red tape. It is also due, however, to the private sector's willingness to use the latest design and construction methods and technologies. The use of alternative delivery methods has been widespread for a number of years, and the private sector does not hesitate to use these methods when it is appropriate to the situation. Some examples of these private sector projects will be presented in Chapter Three.

There are numerous other examples that support the premise that military medical projects take too long. And the effects of this excessive amount of time have already been discussed. Any way the delivery process can be shortened would benefit all parties involved. Before examining alternative delivery approaches, however, an analysis of why this problem exists is in order. This is the subject of Chapter Two, which will discuss the current methods of project delivery for military medical projects and the problems that arise while using these methods.

[1] Stephen J. Williams and Paul R. Torrens, Introduction to Health Services (New York: Delmar Publishers, Inc., 1993), 160.

[2] Air Force Health Facilities Division-Programs Branch, Information obtained from Major Donald Rusher (HQ USAF/SGSFW, Bolling AFB, DC, 11 Mar 96).

[3] Air Force Health Facilities Division-Programs Branch, Air Force Medical Project Summary Report (HQ USAF/SGSFW, Bolling AFB, DC, 1 Dec 94), 1-3.

[4] Air Force Health Facilities Division, Information obtained from Major Steve Swacker, Chief of Construction (Air Force Medical Support Agency, Brooks AFB, Texas, 11 Sep 95).

CHAPTER 2

Why The Problem Exists

As mentioned in Chapter One, medical facilities represent one of the most complex building types in terms of both design and construction. The complexity of the building itself, however, sometimes pales in comparison with the complexity of the facility acquisition process of a federal government agency. This chapter will attempt to shed some light on the acquisition process for DoD medical facilities, and the problems associated with the methods used in that process. Although this report will only make recommendations concerning the design and construction phases, it is felt that an understanding of the entire process is required to give the reader an appreciation of the entire problematic system.

CURRENT METHODS OF PROJECT DELIVERY

In order to fully understand the DoD medical facility acquisition process, it is first necessary to familiarize oneself with the many players involved. This exercise includes comprehending some of the many acronyms that the military is so famous for. Figure 2.1 is a diagram of the agencies involved in a typical Air Force project and their corresponding relationships. Table 2.1 is a listing of acronyms for these agencies and a description of their roles in the process. A few moments spent studying these two figures will greatly enhance the reader's understanding of the ensuing discussion.

AIR FORCE MEDICAL FACILITY ACQUISITION PROCESS

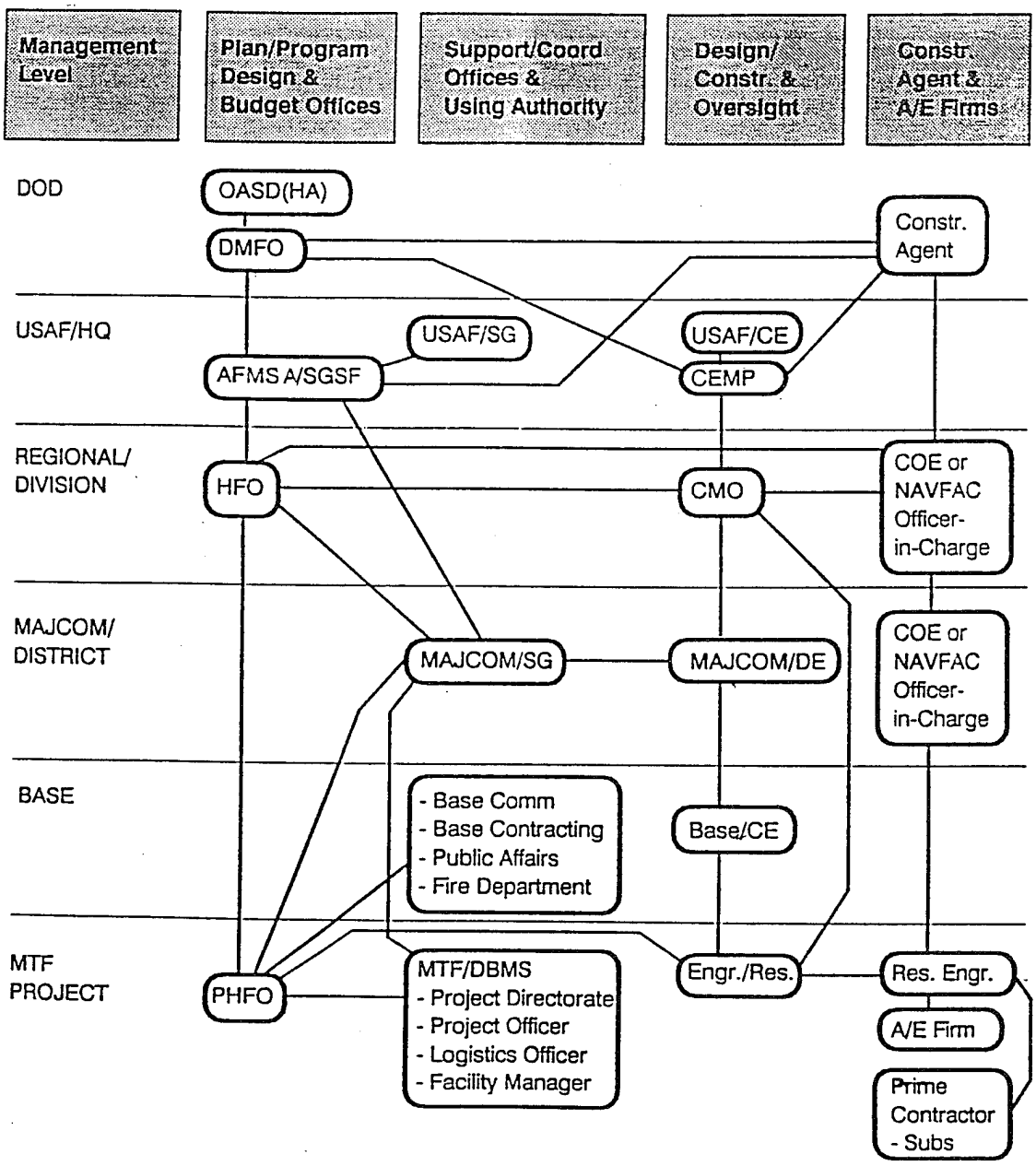


Figure 2.1: Agencies and Relationships[1]

A/E - Architect/Engineer Firm: Responsible for design and preparation of the contract documents.

AFMSA/SGSF - Air Force Medical Support Agency/Facilities Division: Air Force Surgeon General's representative responsible for Air Force medical design and construction. Headquarters for the Regional Health Facilities Offices.

BCE - Base Civil Engineer: Responsible for host base coordination and support.

CMO - Air Force Construction Management Office: Responsible for Air Force project construction management.

COE - U.S. Army Corps of Engineers: Design and construction agent for selected projects.

DBMS - Director of Base Medical Services: Commander of the local medical facility.

HFO - Health Facilities Office: Designated user representative on behalf of the Surgeon General.

MAJCOM/DE- Major Command/Directorate of Engineering: Provides site support as the host command responsible for where the project will be executed.

MAJCOM/SG - Major Command/Surgeon General: Responsible for all medical facilities located within the command.

MTF - Medical Treatment Facility: Local clinic or hospital.

NAVFAC - Naval Facilities Engineering Command: Design and construction agent for selected projects.

OASD(HA)/DMFO - Office of the Assistant Secretary of Defense (Health Affairs)/Defense Medical Facilities Office: Overall responsibility for all medical military construction projects.

PHFO - Project Health Facilities Officer: On-site HFO representative.

Res. Engr - Resident Engineer: On-site representative of the construction agent.

USAF/CE-CEMP - Headquarters Air Force Civil Engineering/Medical Projects: Headquarters for the Air Force Civil Engineering function.

USAF/SG - Headquarters Air Force/Surgeon General: "Owner" of the building.

Table 2.1: Acronyms

One can see from Figure 2.1 the complexity of the relationships between the many agencies involved in the facility acquisition process. In an effort to make some sense out of this web of information, we will start at the beginning and describe the process step-by-step, identifying the major players and their roles along the way. Our discussion will be broken down under the three major headings of Planning, Design, and Construction. Since the recommendations of this report deal with design and construction, these areas will be dealt with in detail in this chapter. Planning will be touched on only briefly here. For a detailed description of the planning/programming process, refer to Appendix A.

Planning. To begin our discussion of the DoD medical facility acquisition process, one needs to refer to Figure 2.2. This is a sample timeline for a typical FY 1995 Military Construction Project (MCP). This sample will be used to aid our discussion. (For another example of a project timeline, refer to Appendix B.)

The sample project in Figure 2.2 shows the need for a new facility was identified in January 1987. This "need" is usually identified through a formal report that documents the shortcomings of the existing facility, such as a Facility Utilization Study (FUS). Once the need is identified, steps are undertaken to determine the size and cost of a new facility. This results in a Program For Design (PFD), a room-by-room listing of the space authorized for a replacement facility, and a projected cost based on guidelines developed by each service. The cost estimate represents the amount that will be forwarded up the chain of command and eventually seek congressional approval and funding.[2]

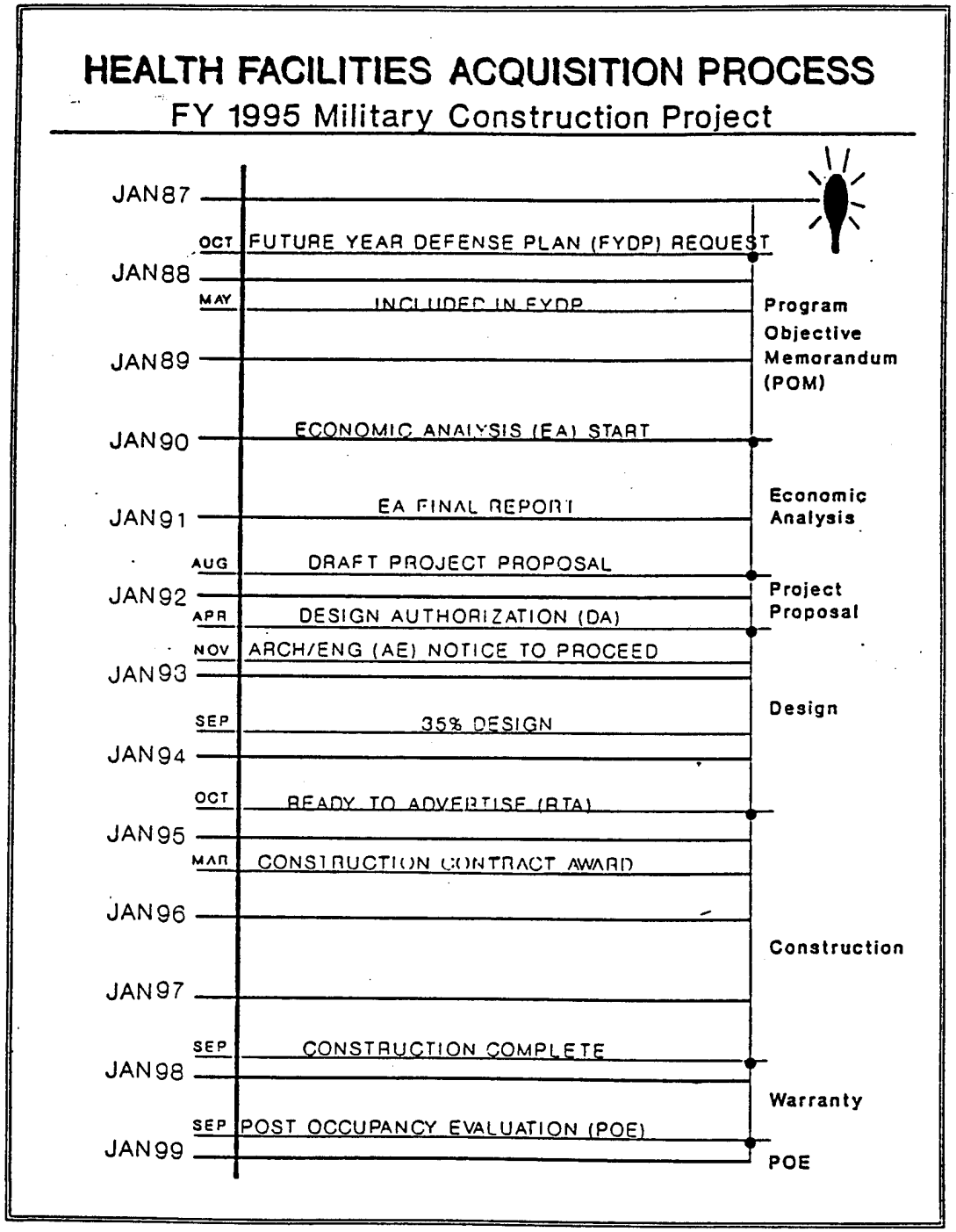


Figure 2.2: Project Timeline[3]

Once size and cost are known, the proper paperwork must be accomplished to formally request that a project be inserted into the program. This results in the completion of a form known as DD Form 1391, Military Construction Project Data. This is the key document that is used to justify the service's request for the size of the project and the amount of money. The immediate goal of the 1391 submission is to get the project included in the Future Year Defense Plan (FYDP). The FYDP is a six year plan of all the medical projects that the services intend to accomplish. In any given year, the FYDP being assembled is for the period beginning two years beyond the current year. Figure 2.2 indicates that our project must be submitted by October 1987 (FY88) to be included in the next FYDP. The FYDP being assembled would be for FY90 through FY95. Since projects from the previous FYDP still occupy FY90 through FY94, new projects generally are slated for the final year of the FYDP. So even though everything was submitted on time and according to schedule, the project we identified in 1986 or 1987 won't even start until October 1994 at the earliest.

For some projects, an economic analysis (EA) is performed. For these projects, the results of the EA are considered in the planning of the project. Figure 2.2 shows that if our project required an EA, it would be accomplished during 1990.

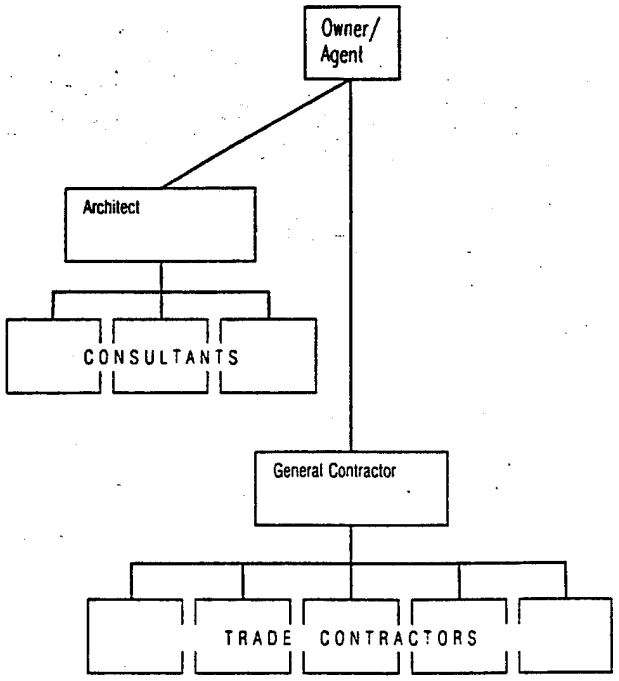
Once a project is in the program, a project planning package is developed to support the project. This package includes the latest 1391 (if it has been revised), a project narrative, the program for design, and a room-by-room equipment list. These documents are generally prepared by the Health Facilities Officers (HFOs) of each service, and sent to the Defense Medical Facilities Office (DMFO) for review and any revisions

which are deemed necessary. Figure 2.2 shows the preparation of the project proposal beginning in August 1991, however, work on this and the other supporting documents probably had been going on since the project was included in the FYDP.

The DMFO is responsible for presenting and defending the proposed program to Congress. Once approved, the next step is for the using service to request a design instruction be issued. Thus, the process moves from the planning to the design stage with the issuance of a Design Authorization (DA). This simplified discussion of the planning process points out the tremendous amount of time it takes just to get a project to the design stage. But since there is little hope that the congressional budget process can be streamlined, we will concentrate on shortening the design and construction process. The only advice that can be given for this stage of the process is to plan projects well in advance, using foresight to identify future needs, rather than waiting until the need is critical to take corrective action.

Design. The design and construction of military medical facilities is accomplished with the "traditional" project delivery method of design-bid-build. In this approach to project delivery, an architect designs the project, producing a set of construction documents that are, in turn, used to select a builder and determine the total price for construction. As shown in Figure 2.3, there are separate contracts for design and construction. Design and construction proceed in a sequential way, with the former fully developed before the latter begins.[4]

For DoD medical projects, the actual physical design of a project normally starts two years prior to the project's programmed fiscal year. However, the initial activities of



Sequential Design and Construction

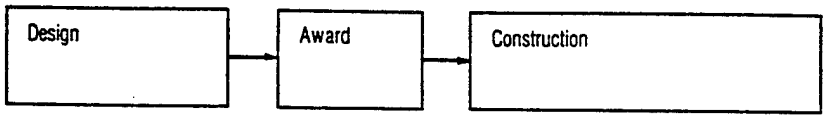


Figure 2.3: Design-Bid-Build[5]

the design phase start the year prior to that. The first action in the design sequence is for the DMFO to issue congressional notification in accordance with Section 2807, Title 10, United States Code. This is done once the project scope has been determined and as required to meet design and programming milestones.[6] This is commonly called "2807 Action," and its purpose is to let Congress know that a particular project is entering the design phase.

The DMFO will then issue an initial Design Authorization to the design agent. This initial authorization only allows the agent to proceed to "two percent design," which means the selection of an architectural/engineering (A/E) firm to design the project. Since all DoD medical projects are competitive, this means preparing an announcement in the Commerce Business Daily (CBD). This announcement remains open for thirty days. Interested firms submit the required forms to the design agent, who then selects the A/E firm following their established procedures. Selection of an A/E is a process very different from that of selecting a contractor. This process usually includes holding a "preselection" board and a "final" selection board. At the preselection board, the list of firms is narrowed down to a "short list" of four to five firms based on their qualifications. From this list, the final selection board chooses one firm to design the project. The military department that the project is for usually participates in A/E selection, and the DMFO may also participate when they deem it appropriate.[7] Once the firm is selected, the DMFO issues the Concepts Design Authorization. This allows the agent to negotiate and award an A/E contract and proceed to the 35 percent level of design.[8] Negotiations take place between the design agent and the firm to establish a basis for compensation, which normally amounts to approximately six percent of the total estimated cost of the project. At the same time, the firm is audited to ensure that they are financially stable and capable of accomplishing the work. Once an agreement has been reached on compensation and the audit has been completed, a formal contract is signed between the design agent and the firm. Only then can the agent issue a Notice To Proceed (NTP) to the A/E. Due to the extensive levels of review, the process just described can take as many as thirty weeks.[9] Looking at Figure

2.2, our project's DA was issued in April 1992, while NTP was given in November of 1992. Thus, we have been in the "design" phase for seven months without a single line being drawn at the A/E's drafting table.

The DoD medical design process consists of Concept Design, which includes four submittals, and Working Drawings, which includes three more submittals. This large number of submittals is necessary due to the complexity of medical facilities. The four submittals of the concept phase are the Block Plans (S-1), Schematics (S-2), Design Development (S-3), and Final Concepts (S-4) which represent 35 percent design completion. The goal is to have the Concept Design completed by 15 September, as can be seen on figure 2.2, where 35 percent design for our FY95 project is completed by September 1993. Considering the fact that the NTP was issued in November of 1992, reaching 35 percent design by September 1993 may seem to be a rather extensive period of time for this to be accomplished. Surely a competent A/E outside this process could reach 35 percent design in less time. Once again, however, the government process is the source of delays. Each submittal has specific requirements that must be met by the design team. After each submittal is complete, copies are sent to all of the involved agencies for their review. Following the review period, there is a review conference held to discuss the comments submitted by the various agencies on the design of the project. Only after all comments and issues are resolved can the A/E proceed to the next submittal. One only needs to refer back to Figure 2.1 to realize that the number of agencies involved can produce hundreds or possibly even thousands of comments at each stage of the design process. Furthermore, the DMFO must review and approve the design after the S-2 and

S-4 submittals. This requires separate conferences at the DMFO offices to present, discuss, and defend the project. This is normally accomplished by the design agent, the Health Facilities Office of the using service, and the A/E.

The block plans (S-1) represent 5 to 10 percent of the total design effort and include at least three substantially different alternative design solutions, so that the government can choose the scheme that best meets their needs. Each plan shows building massing, siting, and layout of the departmental blocks within the building. Each alternative must also include a preliminary cost estimate and narrative description.[10] From these alternatives, the using service selects one plan to be further developed.

The schematic design submittal (S-2) represents an additional 5 to 10 percent of the total design effort and includes development of the detailed room-by-room floor plans, elevations, and initial analysis of the major architectural and engineering systems based on the selected block plan from S-1. The primary purpose of this submittal is to resolve all major space program deficiencies and to fix the footprint of the building. When the S-2 is presented to the DMFO, any requests for scope revisions must be presented at that time. Once the DMFO approves the S-2, scope changes will generally not be entertained, and the designer may proceed with preparing the next submittal.[11]

The design development (S-3) submittal represents approximately 30 percent of the total design effort in all disciplines and includes further development of the S-2 submittal. The purpose of this submittal is to finalize all major design/engineering decisions and to validate project scope and cost.[12]

The final concepts (S-4) submittal is a corrected and refined S-3 package based on the S-3 review, and represents 35 percent of the total design effort. The S-4 is submitted to the DMFO for their review and approval. Final scope and cost are determined with this submission.[13] Following their review, DMFO certifies to the Comptroller completion of 35 percent design and project cost estimates by 15 September. The DMFO then issues Final Design Authorization to the agent. This is authorization to proceed from 35 percent to final design. Any necessary revisions to the Program for Design and the DD Form 1391 are accomplished at this time.[14]

At this point, there is one year remaining before the project reaches its programmed fiscal year of construction. Once again, this seems like ample time to prepare the working drawings for a project in which the conceptual design is already completed. Yet regardless of how quickly the working drawings are completed, the project cannot begin until its programmed year. Rest assured, however, that the entire year will be used in the preparation of the drawings. There are three more submittals, at the 65 percent, 95 percent, and 100 percent design stages. And there is also a Comprehensive Interior Design (CID) package to be accomplished. Again, there are review conferences following the 65 and 95 percent submittals. And depending on the size and complexity of the project, the sheer amount of drawings and specifications produced at this stage can require significant amounts of time for preparation and review. The 100 percent submittal, similar to 35 percent, is a corrected 95 percent package. When the design is complete, the design agent submits a copy of the final bid documents to DMFO.[15] Hopefully, all of this is completed by September of the year prior to project execution. In October, funds for the

construction of the project become available. One can see on Figure 2.2 that our project is ready to advertise in October 1994 (FY95). It has been over three years since the project proposal was submitted, and over two years since the initial design authorization was received. Nonetheless, the project is now ready to move on to the construction phase.

Construction. Although bidding is technically the second phase of the "design-bid-build" process, this discussion will include the bidding process under the heading of construction. It has been almost eight years since the need was identified for our sample project (January 1987), but time has finally reached the fiscal year in which construction is to begin. Construction cannot start, however, until a contractor is procured, and this represents the bidding phase of the project. Contractors for DoD medical projects are selected through the competitive bidding process. Competitive bidding seeks to find the lowest reasonable (and responsive) price for the project through competition for the work.[16] It begins with another advertisement in the Commerce Business Daily, which again remains open for thirty days. During the bid announcement period, drawings and specifications must be reproduced for the bidders. The bid period that follows is dependent on the size and complexity of the project, but can be up to eight weeks. The bids are then validated, and the lowest responsible bidder is selected for the project. The funds for the project must then be procured, which sometimes can take several more weeks. Once the agent has the funds, they can award the contract. Looking at our sample project, all of this activity has pushed the schedule into March 1995, when the construction contract is finally awarded. The Notice To Proceed is normally issued

within two weeks, and a pre-construction conference is held. The contractor has thirty days to begin work from the time he receives the NTP. So actual construction of the project would probably have begun in May 1995, eight and one-half years after it was identified.

Regardless of how long it took to reach this stage in the process, the contractor is now ready to work, with a complete set of construction/contract documents in hand. Most DoD medical construction projects are originally scheduled to be completed within a two to three year time period. Figure 2.2 shows this sample project with a construction period of 30 months, reaching completion in September 1997. This completion date assumes the project was completed according to its original schedule, and even so, is not complete until almost eleven years after project identification. Chances are, however, that the project will not be completed on time. As discussed in Chapter One, many projects go well beyond their scheduled completion date. Some of the reasons for this will be discussed later in this report. For now, however, a review of the management and administration during construction of a DoD medical project is in order.

MANAGEMENT AND ADMINISTRATION

The agent of the U.S. government, either the Corps of Engineers or NAVFAC, continues on as the construction agent for the project. In this capacity, they are responsible for administration of the contract, and fulfilling many of the duties and responsibilities that the architect normally assumes on a civilian project, such as inspections, processing pay requests, negotiating change orders, and reviewing submittals.

Depending on the size of the project, the construction agent may have an office on-site dedicated to that project, or the agent may work the project from an office serving the entire base or region. Many medical projects require several people dedicated solely to that project in order to handle the day-to-day demands of the project.

The using service has their project representatives as well. Most notably, the Health Facilities Office, as the representative of the Surgeon General for that service, has one or more officers dedicated to the project. Again depending on the size of the project, these officers can be located full time on site, or work the project from a regional office. The Health Facilities Officer is the user representative during construction. He acts as the liaison between the local medical facility and the construction agent. He also assists the agent with inspections and submittal reviews. He is responsible for initiating any user-requested change orders.

In addition to the HFO, there are numerous base agencies of the using service that must be coordinated with during the construction process. These include the base engineers, the safety office, the contracting office, the fire department, and the communications group to name but a few. All of these agencies participate to varying degrees in meetings, inspections, etc.

CHANGE ORDERS

One interesting aspect of DoD medical projects is change orders. Each project has a contingency fund which amounts to five percent of the cost of the project. The DMFO allocates these funds to the construction agent. Technically, two percent of these funds

are for construction agent changes (mandatory changes), two percent is for potential user requested changes, and one percent is retained as a management reserve account.[17] In reality, the agent treats the entire five percent as one big reserve account to be used in whatever fashion they deem necessary. And although five percent is supposedly dedicated to each project, this only serves as a loose guideline, since the five percent for all projects in a given fiscal year is allocated to the construction agent. It is not uncommon for funds earmarked for one project to be used on another project. Another aspect of change orders is that all changes with a government cost estimate in excess of $100,000 must be submitted to the DMFO for their concurrence prior to final obligation of contingency funds.[18] Because of this, many change orders are estimated at $99,000 in order to preclude the need to acquire DMFO approval.

As noted, there are several differences in the way a DoD medical construction project and a civilian project are administered. One difference is the number of players involved. All of the above-mentioned agencies have their respective chains-of-command, and personnel at all levels of the chain can and do get involved. There are also more regulations to adhere to, as all governmental regulations must be followed in addition to all applicable codes. And the change order process is different as well. Of course, from a construction standpoint, things are basically the same, since civilian contractors complete the work. However, it takes a certain amount of experience and aptitude from a management standpoint on the part of a civilian contractor to work on a government project.

LUMP-SUM CONTRACTS

Going hand-in-hand with the "traditional" project delivery method of design-bid-build, the type of contract used for the construction of DoD medical facilities is the traditional "lump-sum" contract, also known as "stipulated sum" and "fixed-price" contract. The lump-sum contract gets its name from the fact that the basis of payment is a lump-sum (fixed price). This sum is the amount for which the bidder agrees to do the work. Due to its simplicity, this is still the most common form of construction contract.

The two parties to the construction contract are the contractor and the owner, the owner being in this case the United States Government. Each party has certain duties and rights. The contractor's primary duty in a lump-sum contract is to complete all work as defined and required by the contract documents within the stipulated time stated within the contract agreement. The contractor's primary right is to be paid the contract amount in the agreed manner. The owner's primary duty is to provide access to the site and to pay the contractor according to the conditions set forth by the contract. The owner has several rights, including the right to stop the work, to terminate the contract, and to accept or reject any work.[19]

Advantages and Disadvantages. It is the fundamental nature of lump-sum contracts to be fixed and relatively inflexible. The primary advantage of a lump-sum contract to the U.S. government from the owner's perspective is that the lowest responsible bid can be selected (thus saving taxpayer dollars), knowing that the expenditure should not be more than the stipulated sum--the amount of the contract. But it is not always so simple. If the contractor meets with unforeseen conditions, there may

be extra costs. And there are always changes in the work. Changes can be expensive for an owner, apart from being a source of disturbance and dispute, because changes are simply contrary to the nature of stipulated sum contracts and the owner has to pay according to the best agreement that can be reached. Changes and claims are sometimes the reason for a contractor making a profit instead of a loss. Nevertheless, an owner has greater control of his expenditure in this kind of contract than in most others. However, to achieve this control, adequate design information must be provided to the bidders. The details of the work must all be settled before calling for bids, and it is here that the disadvantages to the owner appear. The work cannot start until the contract is made, and the contract cannot be made until all the documents are prepared.[20] The entire work must be designed first, and we have already shown that the design period can take two to three years.

In order to enable bidders to bid on the same basis, the designer must establish a design and specification for each part of the work. Any second thoughts during construction may necessitate a change order with all of the inherent risks and problems. Yet, designers are not always able to make the best design decision about every part of the work the first time, and sometimes changes are desirable. But once the detail is drawn and the specification written, it is part of the whole lump-sum contract, in which changes can threaten the entire project if they become too large or too numerous.[21]

Because of the nature of lump-sum contracts (and the design-bid-build process) the owner is inevitably deprived access to an important source of expertise and experience--the contractor who does the work. The contractor is solely concerned with

the production of work already designed. Some contractors even prefer this role. For them the lump-sum contract is attractive because it gives the contractor sole control over the organization of the work and he can devote himself to performing the work as efficiently as possible in order to maximize profit. Lump-sum projects do have their place. They are suitable for straightforward work such as residential and commercial work of standard construction that can be fully specified to provide a maximum of design information, and that will be carried out on sites having predictable conditions and offering a minimum of risk. Such straightforward work can be readily estimated and performed at a profit by an efficient contractor in a lump-sum contract.[22] Military medical projects, however, do not fit into the "straightforward" category just described. While a lump-sum contract may be suitable for a military barracks, it is not necessarily the best choice for a medical facility, given its complexity and ever-changing technologies, as described in Chapter One.

THE FEDERAL ACQUISITION REGULATION

One may be curious at this point as to why military medical projects are procured using the traditional methods of design-bid-build and a lump-sum contract. The simple answer is that there is no other choice. Being federal projects, the procurement and contracting methods used are dictated by the Federal Acquisition Regulation (FAR). The FAR provides uniform policies and procedures for acquisitions by executive agencies of the federal government. The Federal Acquisition Regulation System consists of the FAR, which is the primary document, and agency acquisition regulations that implement or

supplement the FAR. For the military departments and defense agencies, this means the Department of Defense FAR Supplement (DFARS).[23]

The FAR requires contracting officers to acquire construction services using sealed bid procedures, and architect-engineer services by negotiation. It also states that firm-fixed-price contracts shall be used to acquire construction services. The fixed-price contract can be on either a lump-sum or a unit-price basis; however, unit-price contracts are not appropriate for medical facilities. Furthermore, the FAR prohibits awarding a construction contract to the firm that designed the project, seemingly ruling out design/build as a delivery option.[24]

It would appear that the FAR stands as a roadblock to the use of alternative delivery approaches for military medical construction projects. However, this is a roadblock that can potentially be overcome. The specific details of the FAR in terms of contracting for design and construction services, and how the roadblock can be removed will be discussed in Chapter Five, once it is shown how alternative delivery and contracting methods can be beneficial to the U.S. government.

PROBLEMS ASSOCIATED WITH CURRENT METHODS

The main problem with the way DoD medical projects are currently delivered is that it just takes too long, which is the premise of this report. There are, however, other problems associated with the use of traditional methods. But these problems can all contribute to the main problem by extending the time it takes to deliver a new facility.

Change Orders. Changes in the work during construction can result from a variety of factors:

- Design errors
- Availability of materials or equipment
- Change in the owner's requirements
- The uncovering of unknown or undisclosed existing conditions
- Value Engineering
- Change in designer preference
- Coordination with equipment/material vendors
- Defective specifications
- Lack of coordination among design disciplines
- Incomplete design

Many of these factors are the source of changes on DoD medical projects. There are inevitable design errors due to the complexity of the projects and the large number of contract documents involved. It is not unusual for a project to have several hundred pages of drawings and five large volumes of specifications. The availability of materials often becomes a problem due to the length of the delivery process. Many times the specific model of an item that is specified is no longer manufactured by the time the order is placed. The discovery of unknown existing conditions can be especially troublesome at overseas locations. Many countries will stop construction altogether if something of potential archaeological significance is uncovered. And "not-in-contract" equipment or government furnished equipment (GFE) accounts for a significant portion of the entire equipment package. Large items such as x-ray machines and sterilizers are procured by the government as GFE, not the contractor. Some GFE is installed by the construction contractor, while others are installed under a separate contract or by the government itself. This requires a great deal of coordination.

The rapidly evolving technology of medical equipment, as was mentioned in Chapter One, is also a source of change orders. Many changes are made to adapt the design to a new piece of equipment, or to redesign the space that will no longer be used for a particular piece of equipment due to the fact that it has become obsolete. Equipment lists are coordinated with the local medical staff throughout the design and construction stages, and many items already in use in the existing hospital are planned for reuse in the new facility. But since the existing hospital must continue to operate during construction of the new facility, they order new equipment as it is needed and becomes available. Changes must then be made to accommodate this new equipment.

Special emphasis must be given to the factor listed as "change in the owner's requirements." The "owner" of a DoD medical project during the construction phase is the Surgeon General of the using service, represented at the working level by the Health Facilities Officer. The ultimate "user," however, is the staff of the local medical facility that will occupy the new building. In the military, this means that the "user" is constantly changing. During the course of construction, commanders and department heads come and go, and each one has their own idea about what "their" facility should be like. It is up to the HFO to try and keep non-essential changes by the user to a minimum, but this is sometimes difficult in the military, where rank and egos are involved. Therefore, many changes may be the direct result of changes in user requirements.

A common result of excessive change orders on a project is inaccurate as-built drawings. As-built drawings show the building as it was actually constructed after all changes from the design have been accounted for. On military bases, as-builts are kept by

the base engineering function, and usually by the facility manager of the medical facility as well. Accurate as-built drawings are important for any future work done on the facility, including maintenance, repair, renovation, or an addition/alteration construction project. Inaccurate as-builts can result in wasted money when any work is attempted. Of course, the more change orders a project has the more likely it is for some changes not to be reflected on the as-builts.

Table 2.2 shows the impact of change orders on selected DoD medical projects. When the cost of these changes is considered, along with the fact that change orders are an inevitable part of design-bid-build and lump-sum contracts, one begins to question the rationale of using the traditional process in order to save taxpayer dollars.

Complexity of the Projects. Medical projects represent one of the most complex building types to design and construct, and the traditional methods of design-bid-build and a lump-sum contract are simply not responsive to this fact. The coordination required between the design and construction is tremendous. The lack of coordination in the traditional process is the source of many claims against the designer. Claims are another problem with DoD medical projects because the complexity of the facilities leads to numerous errors and omissions in the design documents.

It could be argued that the design and construction agent (COE or NAVFAC) has control over the entire process, and from a contractual standpoint, they do. The agent does in fact review, monitor, and coordinate many items. But these agents are responsible for the entire military construction program, not just medical facilities, and therefore do not specialize in any one building type. Specialization is a necessity for medical facilities.

The Impact of Change Orders

Project	Original Contract Amount	Value of Changes	Changes as % of Contract Amt
Hospital Replacement, Portsmouth, VA (Phase II)	$ 28,370,000	$ 4,996,490	17.6%
Medical/Dental Clinic, Pascagoula, MS	$ 1,745,000	$ 141,072	8%
Hospital Replacement, Sigonella, Italy	$ 11, 936,718	$ 3,098,821	26%
Hospital Replacement, MCAS Cherry Point, NC	$ 22,392,000	$ 1,958,684	8.7%
Medical/Dental Clinic, New River, NC	$ 3,219,832	$ 271,893	8.4%
Dental Clinic Addition/Alteration, Parris Island, SC	$ 2, 909,800	$ 237,916	8%
Composite Medical Facility Rpmt, Travis AFB, CA	$ 151,528,391	$ 9,380,816	6.2%

TABLE 2.2: Change Orders [25]

This is why each service has Health Facilities Officers to represent the user (no other military personnel specialize in a single building type). But the HFOs are responsible only for medical-functional aspects of the project, and are not trained in contract administration. The agent and the HFO must act as a team on the government side, but a team on the contractor's side is also needed if the project is to be successful.

Need for Coordination. The need for coordination on a construction project occurs at many levels. People, equipment, and systems all must be coordinated. On DoD medical projects, these things are numerous and complex. We have already shown the many players involved in the process, and coordination amongst these players is a major task in and of itself.

Medical facilities consist of numerous building systems, and the coordination of these systems during design and construction can be extremely complex. The heating, ventilation, and air-conditioning (HVAC) system is also an infection control system. Certain rooms, such as operating rooms, have special filtering requirements. And while most building HVAC systems are balanced for a neutral air pressure, each room in a medical facility has specific requirements for air balance, temperature, humidity, air changes, etc. The electrical system's emergency branch has several different levels of emergency power, and specialized pieces of medical equipment have specific and unique power requirements. The plumbing system must deal with requirements for deionized water, reverse osmosis (RO) water, and sanitary waste. The medical gas system is an additional plumbing system found in medical facilities, and must be certified by an expert in the field. The communications systems in a medical facility can include telephones,

computers, central dictation, public address, paging, nurse call, and physiological monitoring systems.

Coordinating the requirements of these many systems during design is difficult, and it is often left to the contractor to determine, for example, how to make the HVAC duct, electrical conduit, lighting, and gas lines fit in the space above the ceiling. The design-bid-build process exacerbates this problem by separating the design and construction teams. If construction expertise were made available during design, these types of problems could be mitigated.

We have already mentioned that GFE is a source of change orders. It also requires careful coordination between the government, the designer, the contractor, and in some cases a second contractor. The government must provide information on the types of equipment being procured; the designer, based on the information received from the government, must design the building to accept the equipment and specify the required connections; and the contractor must install the item. If a second contractor (e.g. a manufacturer) is installing the item, he must coordinate with the main contractor. If one entity could monitor the process through design and construction, coordination would be much simpler.

The problems associated with military medical projects point to the need for a better way to manage the process. Design-bid-build is the slowest method of project delivery. Furthermore, it is not the best approach to use for large, complex projects.

Construction management and design/build offer distinct advantages over the traditional approach, and it is to these forms of project delivery that our discussion now turns.

[1] Air Force Health Facilities Division, Adventures In Training (Air Force Medical Support Agency, Brooks AFB, Texas, 10 April 1992), 9A.

[2] Air Force Health Facilities Division-Programs Branch, Air Force Health Facilities Division Guide to DD Form 1391 Preparation for Medical Military Construction Projects (HQ USAF/SGSFW, Bolling AFB, DC, 24 April 1992), B2.

[3] Air Force Health Facilities Division, 9B.

[4] David Haviland, The Architects Handbook of Professional Practice, Chapter 2.1, "Delivery Approaches" (Washington, D.C.: American Institute of Architects, 1988), 9.

[5] Ibid., 8.

[6] Defense Medical Facilities Office, 15.

[7] Department of Defense, Military Handbook 1191- Department of Defense Medical and Dental Treatment Facilities Design and Construction Criteria (Washington, D.C., 15 October 1991), 2-3.

[8] Ibid., 2-3.

[9] Air Force Health Facilities Division, MCP Project Time Line (Air Force Office of Medical Support, Brooks AFB, Texas, 31 January 1986), 3.

[10] Department of Defense, 2-7.

[11] Ibid., 2-6,7.

[12] Ibid., 2-9.

[13] Ibid., 2-13.

[14] Ibid., 2-3,4.

[15] Ibid., 2-15.

[16] Haviland, 22.

[17] Defense Medical Facilities Office, 22.

[18] Ibid., 22.

[19] Keith Collier, Construction Contracts (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1987), 60-67.

[20] Ibid., 75-76.

[21] Ibid., 76.

[22] Ibid., 76-77.

[23] Federal Acquisition Regulation (Chicago, IL: CCH Incorporated, 1995), 16,011-16.

[24] Ibid., 18,272-4.

[25] Defense Medical Facilities Office, DMFO Quarterly Medical Program Report (Office of the Assistant Secretary of Defense (Health Affairs), 7 Dec 1993).

CHAPTER 3

Alternative Delivery Methods

Several alternatives to the traditional design-bid-build process have been developed over the years, including construction management, design/build, program management, and build-operate-transfer, among others. All of these methods, however, were developed primarily because of the shortcomings of the traditional process, with specific emphasis on the inability of design professionals and contractors to use efficient management skills.[1]

This chapter will discuss construction management and design/build, since these two methods seem to be the most commonly used on medical projects in the private sector, and because they represent the basic formats from which other methods have developed.

Construction Management

DESCRIPTION

A description of the construction management approach needs to include some historical background. With the ever-increasing inflation of the 1970s, owners began to realize the importance of the time-value of money. The sequential phasing of activities of the traditional approach was costing owners both time and money. The process of estimating construction costs, which had been relatively stable for many years, became more difficult. Projects, redesigned because of high bids, or low estimates, had substantial

portions of work removed.[2] Design professionals were faulted because of their casual attitudes toward costs, their inability to predict costs, and their ignorance of the labor and materials market, as well as costs of employing construction techniques. Owners were also concerned about the tendency of design professionals to take less responsibility for quality control, policing schedules, and monitoring payments. Contractors also came in for their share of blame. Some lacked skills in construction techniques and the ability to work with new materials. Others did not have the infrastructure to comply with the increasingly onerous and detailed workplace safety regulations.[3] In response to this, the construction management project delivery approach became popular.

Construction management treats the project planning, design, and construction phases as integrated tasks. This approach unites a three-party team consisting of owner, designer, and construction manager in a non-adversarial relationship. The team works together from the beginning of the design to project completion, with the common objective of best serving the owner's interests. Contractual relationships among members of the team are intended to minimize adversarial relationships and contribute to greater responsiveness within the management group. Interactions relating to construction cost, environmental impact, quality, and completion schedule are carefully examined by the team so that a project of maximum value to the owner is realized in the most economical time frame.[4]

The construction manager (CM) may be defined as a specialized firm or organization which furnishes all of the administrative and management services of a general contracting organization as well as all of the consulting services necessary and as

required by the owner from planning through design and construction to commissioning. The CM has a professional services contract with the owner and provides consulting and managerial functions. The CM, as the construction professional on the project team, is responsible for design constructability review, liaison in the proper selection of materials and methods of construction, cost and scheduling information and control, as well as quality requirements. He is also responsible for managing the actual construction activities, including all construction operations normally associated with a contracting organization.[5] Most construction managers come from a construction background. By developing the ability to prepare conceptual estimates and schedules, they expand their services into the design phase of a project. Architects can also become construction managers by developing an expertise in areas beyond the basic services they typically provide during design and construction. Regardless of the background, a construction manager needs to have expertise in both design and construction.[6]

Construction Management Formats. The construction management approach offers flexibility in responding to the needs of the owner. There are a number of possible variations of the construction management format. Figure 3.1 shows the five basic construction management formats. The formats shown in Figure 3.1, as well as all others, can be classified into two basic contractual forms. These are 1) CM as an agent to the owner (Figure 3.1e, where the owner holds the contracts for construction), and 2) the CM "at risk" (Figure 3.1a through d, where the CM holds the contracts for construction).

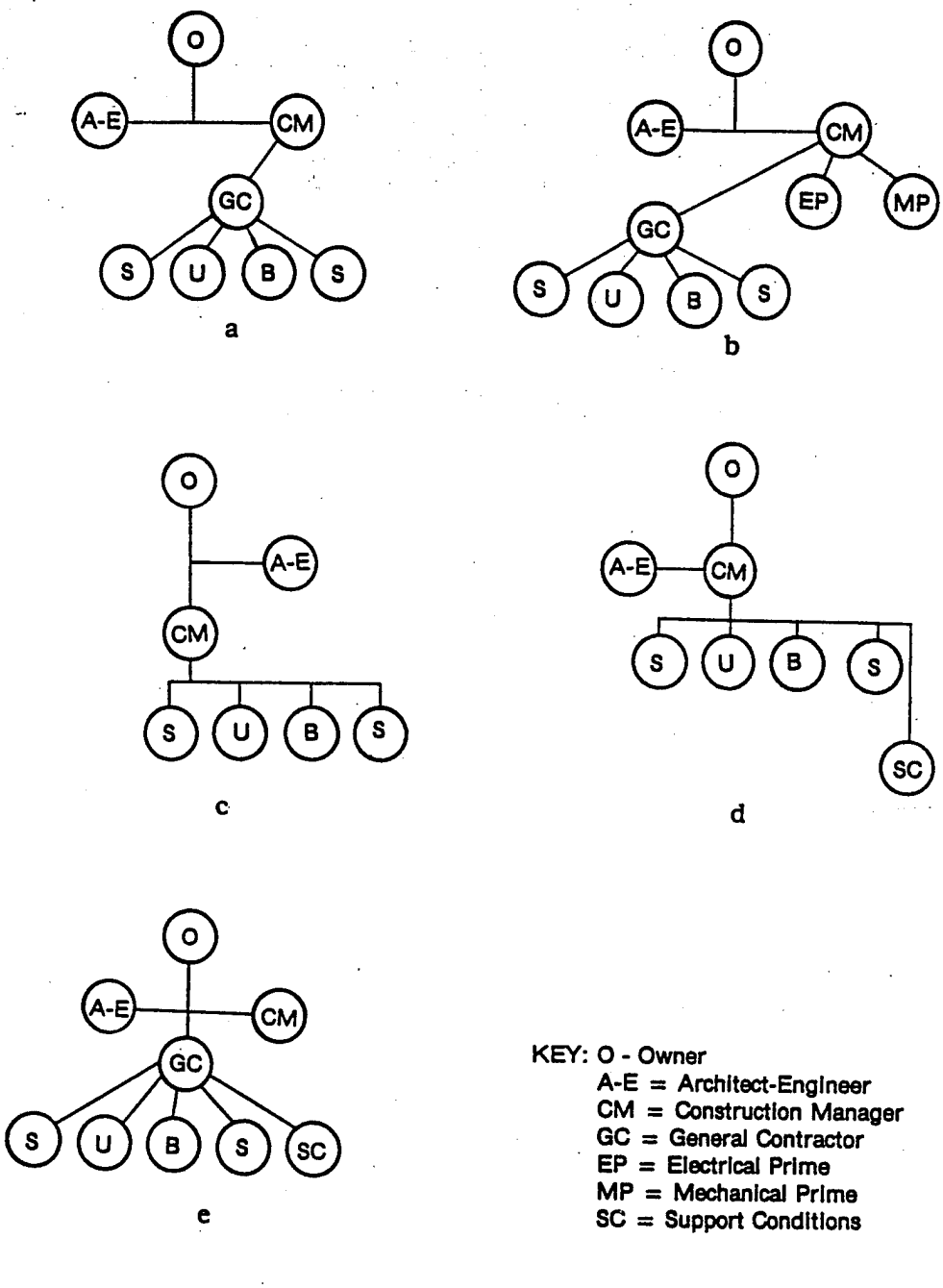


Figure 3.1 Basic Construction Management Formats[7]

In the role of owner's agent, the CM joins the owner and architect as a "construction consultant" in the design phase of the project. This consultant provides input about cost, scheduling, and constructability of the design as it is being prepared by the architect. Information provided by this consultant is offered early in the project when its impact on the owner's cost, time, and quality objectives will be greatest. The construction consultant may or may not participate in the construction phase. If he does participate, in the agency format he continues solely as an advisor to the owner. A separate general contractor, or multiple contractors, under direct contract(s) with the owner, is selected to do the actual construction of the project. The CM assists the owner by assembling bid packages, encouraging bidding on a project, negotiating construction contracts, coordinating work performed by the design team, establishing and monitoring a project control system (suggesting corrective action when needed), and reviewing and negotiating change requests. The CM manages the entire process, keeping the owner informed about the status of the project.[8]

In the CM at risk format, the construction manager assumes the role of a general contractor, with all the risks and obligations that go with it. The CM holds the construction contracts directly. In this arrangement, the CM gives a guaranteed maximum price (GMP) for the project prior to the commencement of construction. The construction manager may perform some of the work with his own forces[9] or he may simply provide for the general conditions. This variation does provide the owner with a maximum financial liability position through the GMP. The CM assumes financial responsibility if the actual costs exceed his guarantee.[10]

Construction Management Services. Several of the functions of a CM have been mentioned in the preceding paragraphs. There is a wide range of professional services provided by the CM during both the design and construction stages. In negotiating with a CM, the owner can choose from among these services and select only those which he requires. A detailed description of CM services is included as Appendix C.

ADVANTAGES OF CONSTRUCTION MANAGEMENT

The overall benefit of the CM process is its ability to control, through team effort, the time, cost, and quality of a construction project, thereby meeting the objectives of the owner.[11] The growth in use of CM contracts validates the efficacy of the system. The specific benefits of construction management, which contribute to the overall benefits just mentioned, are outlined below.[12]

1. By being involved in the project from inception to completion, the CM firm is in a position to control all of the variables that influence cost, time, and quality.

2. The CM contributes construction knowledge early in the design phase, and is able to perform value analysis and life cycle analysis to ensure optimal design of the project regarding cost, time, and quality.

3. Due to his everyday involvement in the construction industry, the CM has better access to cost information than most A/Es. He is therefore able to make better preconstruction estimates. This will improve project designs and prevent delays that result from duplication and projects being re-bid because of bid overruns.

4. CM contracts are flexible, and can be structured to give the owner as much or as little involvement as desired or needed.

5. The CM's knowledge of the construction industry enables a better execution of the purchase of materials than in the non-CM process. This offsets the consequences of material shortages, lengthy project delays, or escalating material costs, all of which result in escalated project costs. The CM is expected to know and forecast the availability and cost of materials before the contract to install them is awarded. Thus long-lead items can be purchased early and expedited so that they get to the site as required.

6. The reduction of the A/E's involvement in project estimating offers potential reduction of A/E fees.

7. The CM contract offers potential reduction in the contractor's overhead through the elimination of the general contractor. This also increases fairness in competitive bidding by specialty contractors because they can bid directly as prime contractors, thus eliminating bid shopping, auctioning, and other unethical practices some general contractors adopt in selecting subcontractors.

8. Competitive bidding on all systems by contractors in the CM contract gives the project owner the opportunity to realize potential savings.

9. The direct prime relationship in the CM contract (when the owner or CM holds the contracts directly with the various contractors) enhances the contractor's potential for early receipt of progress payments and owner-held retainage.

10. The CM process has the potential to reduce or eliminate adversarial relationships that characterize the traditional process. By emphasizing teamwork, the CM

process encourages the project participants to work together, rather than against each other, thus creating a harmonious team.

11. The CM process allows for the phasing of design and construction. This can result in considerable reduction in total project time, consequently reducing the impact of inflation on total project costs. (Phasing, also known as fast-tracking, will be discussed in detail later in this chapter.)

EXAMPLES OF CIVILIAN CONSTRUCTION MANAGEMENT MEDICAL PROJECTS

Construction management contracts and phased construction scheduling have been used for hospital projects successfully since the early 1970s. The following are two examples of CM medical projects.

Sacred Heart Hospital. The Sacred Heart Hospital is a large acute care hospital located in Yankton, South Dakota. In the late 1970s, the hospital began planning for a replacement facility. The new hospital would consist of a five-story structure of approximately 139,000 square feet containing 144 beds. The construction management approach was selected as the most effective method for satisfying the needs of the owner.[13] The contract with the CM included a guaranteed maximum price.

The CM's contribution to this project was enhanced by its early involvement and close participation with the other team members. The role of the CM was heavily oriented to definition and control of all issues relating to budget and schedule. The CM provided all general conditions for the project, but performed no trade contract work.[14]

In September of 1978, the CM team began performance of early design phase services for the project. Construction work at the site was begun in August 1979, with a planned completion scheduled for March of 1982. However, effective utilization of the CM approach resulted in beneficial occupancy on October 1, 1981. The hospital was in full operation on November 21, 1981, a full six months ahead of schedule.[15]

The initial construction budget for the Sacred Heart Hospital was set at $14,228,330. The completed cost was actually $12,020,456,[16] a savings of over $2.2 million, or more than 15 percent of the original budget. Change orders amounted to $408,284,[17] only 3.4 percent of the final cost of the project.

The reduction in the schedule was attributed to fast-tracking the project, and also to the communication tools developed by the CM team. The financial success of the project was credited to the tight controls maintained by the CM process, such as studious bid packaging and value engineering performed on major construction systems and components. The project manager for the CM firm stated after the project, "I suppose that the job was so well coordinated, so well planned, that its hard to think of what we could have done to improve it more than we did."[18]

St. Luke's Hospital Medical Center. The St. Luke's project was a renovation/addition project in Phoenix, Arizona, which spanned the period from 1978 to 1983. The project included:[19]

- a new 150 bed, 88,503 square foot Behavioral Health Center
- a new 7-story tower consisting of an 85,500 square foot, 2-story, 20 bed addition to the main hospital and a new 66,387 square foot, 4-story medical office building built over the main hospital addition
- a 46,600 square foot remodel of the main hospital
- a 25,454 square foot remodel of the garden pavilion, an ancillary support area
- a 28,800 square foot remodel of the doctor's office building

The St. Luke's board of directors made the decision to use the CM approach based, in large part, on the hospital's desire to fast track the project and thereby reduce the impact of rising interest rates, which at the time were running at one to one-and-a-half percent per month.[20]

The CM's primary responsibilities were to cooperate with the A/E in furthering the interests of the owner; to furnish efficient business administration and superintendence; and to perform the construction work in the best way and in the most expeditious and economical manner consistent with the interests and goals of the owner. The CM undertook to establish budget and schedule controls and to monitor these items throughout the life of the project. The CM assumed responsibility for coordinating and controlling the team effort through its management information system. The CM also provided construction expertise during the pre-design and design phases, assumed construction phase responsibility as construction manager/general contractor, and agreed to provide a guaranteed maximum price acceptable to the owner.[21]

The final cost of the St.Luke's project was approximately $28,066,541.[22] This was over $740,000 less than the initial cost estimate included in the Certificate of Need application,[23] and $91,000 less than the revised contract amount. The first schedule developed by the project team showed a completion date of January, 1983. Despite extensive changes to the project scope, the project was completed only three weeks behind this original schedule and three months ahead of the revised contract completion date of May, 1983.[24]

The project team felt that the scheduling and cost control aspects of the project were extremely effective. One reason for the CM's ability to control cost and time was its dual role as construction manager/general contractor. This allowed the CM/GC to set the pace of the project, coordinate the flow of work, enforce strict quality control, and permit the flexibility needed by the owner. The use of a GMP had a positive impact on the project. The owner, aware that renovation has a high degree of risk, assigned that risk to the CM by requiring a GMP once the scope of the project had been clearly defined. The CM thus had a definite interest in controlling costs, with savings flowing back to the owner.[25]

Design/Build

DESCRIPTION

In the design/build approach, responsibility for both design and construction is vested in a single entity. The owner writes one contract, assigning "single-point" responsibility for the project. The design/build entity usually proposes the design and construction price simultaneously, and the construction commitment is made very early in the process.[26] Generally, a guaranteed maximum price is provided at or near the conclusion of the design development phase.[27] Design and construction may or may not be fast-tracked.[28]

Design/Build Formats. As shown in Figure 3.2, the owner has only one contract for design and construction, and that contract is with a design build entity; everyone else subcontracts with that entity.

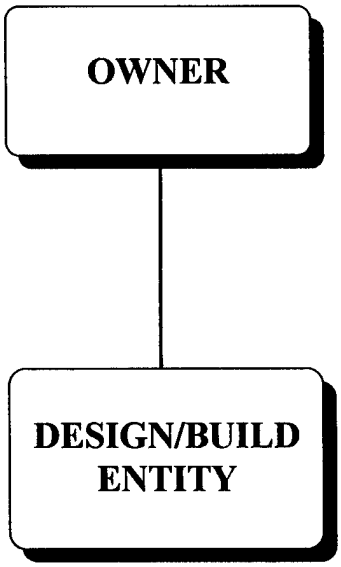


Figure 3.2: Design/Build Contract[29]

There are, however, a number of common variations on the form the design/build entity may take. The entity may be:[30]

- A single organization with its own architectural and construction staffs;

- An organization with its own construction staff, hiring the design architect as an independent subcontractor;

- A business firm contracting with both the design architect and the builder(s) as independent subcontractors;

- A joint venture or association of an architect and a builder.

ADVANTAGES OF DESIGN/BUILD

Design/build offers many of the same advantages that construction management does, in addition to some benefits unique to this delivery approach. These advantages are outlined below.

1. Design/build offers a single point of responsibility. With other approaches, design and construction services are provided by different companies. When a problem occurs, there may be difficulty in trying to determine its cause. For example, when the roof leaks, with other approaches the architect looks at construction-related issues such as whether the correct materials were provided or if the roof was built as shown on the contract documents. The contractor investigates design-related issues. This process may take some time and the owner may be involved before the issue is resolved. With design/build, these problems should not exist. Design and construction services are provided by one entity. Regardless of the cause, the design/build firm is responsible for the solution.[31] This results in reduced litigation and quicker resolutions.

2. Overall design and construction time can potentially be reduced through the use of phased construction.[32] In addition, because the design and construction services are provided by a single source, each knows what the other will produce, resulting in a quicker turnaround. Integrated design/build firms with experience, utilizing design solutions from past projects, can provide an even quicker turnaround.[33]

3. There is unlimited opportunity for construction expertise to be incorporated during the design phase,[34] including constructability reviews, value engineering and

life-cycle analysis, detailed estimating and scheduling, and knowledge of labor and material markets.

4. Implementation of changes is simplified throughout the construction program.[35]

5. The design/build process naturally emphasizes teamwork.

On some projects in the private sector, a disadvantage of design/build is that the system of checks and balances between the architect and the contractor is significantly reduced. Therefore, some owners hire an "administrative architect" to act as an agent representing the owner's interests.[36] This, however, should not be a concern on military medical projects, since contract administration would still be provided by the design and construction agent, either the Corps of Engineers or the Naval Facilities Engineering Command.

EXAMPLES OF CIVILIAN DESIGN/BUILD MEDICAL PROJECTS

The design/build approach has experienced increasing use on hospital projects over the past several years.[37] The following are examples of design/build medical projects.

Magan Medical Clinic. The Magan Medical Clinic in Covina, California, is a multi-specialty clinic that had a dire need for additional space, but also had concerns over the cost of that space. These cost concerns prompted the Magan officials to consult with a design/build firm. The firm's promise of fast construction, combined with good reviews from other clients, convinced the clinic to use this approach.[38]

The project was a 20,750 square foot two-story addition to an existing three-story building. The clinic includes medical suites for minor surgery, opthamology, physical

therapy, cardiology, neurology, and dermatology. The design included an open courtyard, extensive sound-conditioning in all medical suites, and a stucco, glass, and slumpstone exterior finish.[39]

This project incorporated off-site construction and on-site erection by the design/build firm. Much of the electrical, mechanical, plumbing, and structural work was accomplished off-site. The project was completed in February, 1988, 139 days from the start of off-site construction to the date of occupancy. This represented approximately half the time the project would have taken had it been procured using traditional methods.[40]

UC Davis Medical Center. The University of California at Davis Medical Center completed two projects using the design/build approach, a Satellite Surgery Suite and a Trauma Nursing Unit. The surgery suite was prompted by a critical space limitation in the facility's operating rooms, causing it to lose elective surgery cases to other hospitals. The project consisted of an 8,640 square foot surgical suite addition, including four operating rooms, a pre-op area, and eleven recovery stations. Surgical support areas include special procedures, decontamination, film processing, and clean and soiled linen/utility rooms. This project was completed in 150 days.[41]

The Trauma Nursing Unit project was accomplished because the Medical Center did not have the space required to treat a rapidly growing patient load. UC Davis is the only trauma center within a seven county area that is equipped and staffed for major traumatic injuries. Each year 3,500 trauma patients are admitted. Extra beds were needed quickly and a conventional construction time frame was unacceptable. The project was a

12,600 square foot acute-care facility, including thirty-eight total beds, two isolation rooms, fourteen semi-private rooms and two four-bed wards. This project was completed in 156 days.[42]

KIRTLAND AFB CLINIC PROJECT

The clinic replacement at Kirtland AFB in Albuquerque, New Mexico, is the only DoD medical project built under a design/build contract. The fast track schedule allowed for design and construction to be completed in less than two years on a 97,900 square foot facility. The project was classified as a FY87 project because that is when the design/build contract was awarded. Construction actually began in FY88.[43] The Programmed Amount for the project was $16 million.[44]

A separate A/E firm was contracted to prepare the documents required for contract bidding by design/build firms. These documents consisted of the Instructions to Bidders, design criteria, design calculations, and an equipment list. The contract was awarded on August 25, 1987. Notice to proceed was issued on September 11, 1987.[45]

The 65% design documents were submitted on December 3, 1987. This submittal included the 100% civil and structural design drawings, which allowed construction to commence on the sitework and the major structural portion of the building. 100% design was submitted on March 3, 1988,[46] less than six months after Notice to Proceed. By this time, construction had reached 13.5% completion.[47]

Substantial completion of the project was reached in April 1989,[48] nineteen months after design began, and sixteen months after construction commenced. The final cost of

the building was $15,973,000.[49] Compared to a typical DoD medical project (refer to Chapter One), these figures are impressive. The project was not without it problems, however, which was to be expected since this was the first attempt at design/build. There were several changes determined to be beyond the scope of the design/build contract, so a follow-on contract was awarded, which ran from May to August, 1989.[50] But even including this work, the project was completed in less than two years.

The success of the Kirtland Clinic indicates that DoD medical projects can be delivered on time and under budget using alternative delivery systems.

ADVANTAGES OF CM AND DESIGN/BUILD FOR DoD MEDICAL PROJECTS

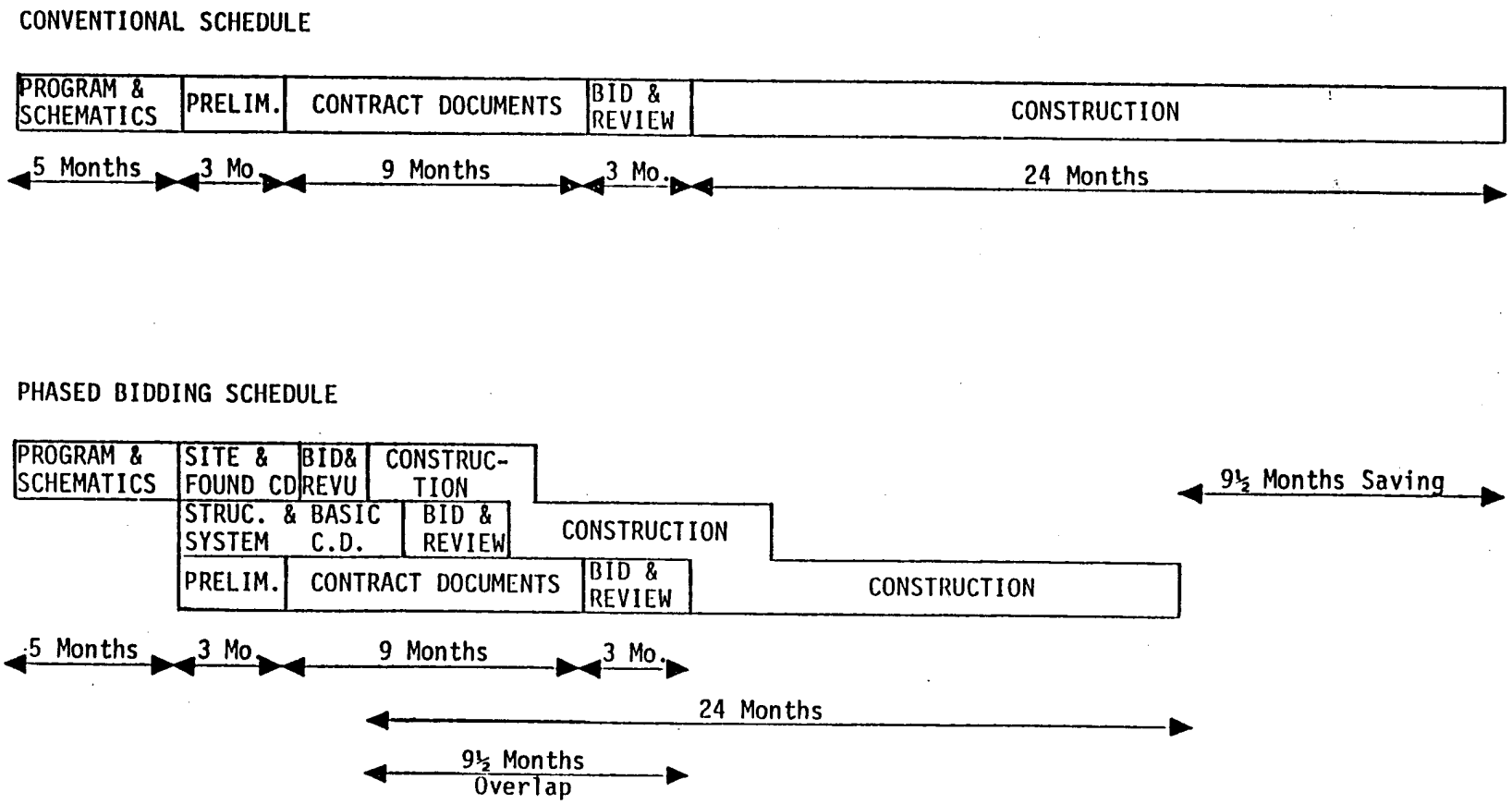
The advantages that alternative delivery approaches hold for DoD medical projects are those that directly address the problems associated with the current methods of project delivery, which were discussed in Chapter Two. Specifically, reduced claims and change orders, coordination between design and construction, and reduced project procurement time are the major benefits offered.

Because of the complexity of medical projects, the coordination required between design and construction virtually demands that some entity be responsible for the entire process, be it in the form of a construction manager or a design/build firm. This would greatly reduce the amount of change orders during construction. It would also virtually eliminate claims against the designer. Furthermore, the reduced project delivery times associated with these methods would lessen the likelihood of equipment requirements changing during the life of the project. And the availability of construction expertise

during design would improve the chances of the building being able to accept the equipment without modification.

The main benefit of CM and design/build, however, is that they offer the potential to realize our ultimate goal: shortening the delivery process (in addition to controlling costs). Improved scheduling and coordination during design and throughout the project can significantly speed up the work. Second, because of the reduction in claims and change orders, there is less opportunity for contract extensions. But the biggest advantage these approaches offer, in terms of time savings, is the potential to use phased construction. Keep in mind that these systems can be utilized without phasing the work. It is always an option, however, when time constraints are critical.

Phased Construction (Fast-Tracking). The fast-track approach (shown in Figure 3.3) overlaps design and construction, thus shortening the overall project duration.[51] This usually means that excavation, foundation, and some structural work are begun before all of the design is complete.[52] Design work on fast-track projects is usually taken to the design development stage. At this point, separate construction packages are defined and separate construction documents are prepared for each package. The number and timing of packages varies; early ones may include demolition and site preparation, foundations and structure, and long lead-time items. Exterior closure and major mechanical systems may follow. Interior construction, casework, and finishes may not be bid or negotiated until late in the project.[53]



Example of

COMPARATIVE PROJECT SCHEDULES

CONVENTIONAL VS. PHASED CONSTRUCTION

Figure 3.3: Phased Construction[54]

The use of phased construction requires more than ordinary coordination of the design and construction elements to prevent chaos and extraordinary costs. Because these projects are divided into packages, it is apparent that careful coordination and integration of elements such as design and construction times, availability and acquisition of materials and labor, and the continuous estimation of costs are critical to the project's success.[55] It is in these areas that CM and design/build firms excel.

As figure 3.3 illustrates, all work elements in the phased schedule still require the same amount of time individually as they do in a conventional schedule. However, because they have been overlapped, the total time for completion has been substantially reduced.[56]

It is clear that construction management and design/build offer advantages to military medical projects. In order for these advantages to be realized, however, these delivery approaches must actually be used. It is simply a matter of the decision-makers realizing these advantages, and then taking appropriate action to authorize the use of alternative project delivery methods.

[1] Justin Sweet, Legal Aspects of Architecture, Engineering, and the Construction Process (St. Paul, MN: West Publishing Company, 1994), 363.

[2] John Grattendick, Project Delivery Approaches: Different Options, Different Objectives (Chicago: American Society for Hospital Engineering of the American Hospital Association, 1990), 6.

[3] Sweet, 363.

[4] Donald S. Barrie and Boyd C. Paulson, Professional Construction Management: Including CM, Design-Construct, and General Contracting (New York: McGraw-Hill, Inc., 1992), 35.

[5] Kwaku A. Tenah and Jose Guevara, Fundamentals of Construction Management and Organization (Reston, VA: Reston Publishing Company, Inc., 1985), 385, 387.

[6] Grattendick, 6.

[7] Tenah and Guevara, 386.

[8] Grattendick, 6-7.

[9] William M. Eaves and Peter B. Laubach, Managing Hospital Design and Construction Programs (Chicago: The Foundation of the American College of Healthcare Executives, 1987), 75.

[10] Ibid., 75.

[11] Tenah and Guevara, 382.

[12] Ibid., 394-96.

[13] AGC CM Committee, Construction Management Delivery Systems for Hospital Facilities (Washington, D.C.: The Associated General Contractors of America, 1983), 63.

[14] Ibid., 69.

[15] Ibid., 85.

[16] Ibid., 85.

[17] Ibid., 85.

[18] Ibid., 85.

[19] Ibid., 12.

[20] Ibid., 12.

[21] Ibid., 14.

[22] Ibid., 32.

[23] Ibid., 17.

[24] Ibid., 32.

[25] Ibid., 33.

[26] David Haviland, The Architects Handbook of Professional Practice, Chapter 2.1, "Delivery Approaches" (Washington, D.C.: American Institute of Architects, 1988), 14.

[27] Eaves and Laubach, 73.

[28] Haviland, 14.

[29] Ibid., 15.

[30] Ibid., 14.

[31] Grattendick, 12.

[32] Barrie and Paulson, 34.

[33] Grattendick, 11.

[34] Barrie and Paulson, 34.

[35] Ibid., 34.

[36] Grattendick, 12.
[37] Eaves and Laubach, 72.
[38] Design Studies: Magan Medical Clinic (Anaheim, CA: PBS Building Systems, Inc., 1989)
[39] Ibid.
[40] Ibid.
[41] Project Summary: Satellite Surgery Suite, University of California, Davis, Medical Center (Anaheim, CA: PBS Building Systems, Inc., 1989)
[42] Project Summary: Trauma Nursing Unit, University of California, Davis, Medical Center (Anaheim, CA: PBS Building Systems, Inc., 1990)
[43] Donald Rusher, Kirtland AFB Medical Clinic Replacement Facility History, (1989), 1.
[44] Air Force Health Facilities Division-Programs Branch, Air Force Medical Project Summary Report (HQ USAF/SGSFW, Bolling AFB, D.C., 1 December 1994), 2.
[45] Rusher, 1.
[46] Ibid., 2.
[47] Ibid., 9.
[48] Ibid., 11.
[49] Air Force Health Facilities Division-Programs Branch, 2.
[50] Rusher, 13.
[51] Haviland, 11.
[52] Eaves and Laubach, 76.
[53] Haviland, 11.
[54] Eaves and Laubach, 77.
[55] Ibid., 76.
[56] Ibid., 76.

CHAPTER 4

Alternative Contracting Methods

When using alternative delivery approaches such as construction management and design/build, it is often beneficial or even necessary to use some form of contracting other than the lump sum contract, which was described in Chapter Two. This chapter discusses cost-plus-fee and negotiated contracts. In addition, a brief discussion of privatization is included.

COST-PLUS-FEE CONTRACTS

Description. The title *cost-plus-fee contract* is descriptive and comes from the fact that in such a contract the owner pays the contractor all of the costs of the work, plus a fee to cover the contractor's overhead and profit.[1] The fee can be a fixed fee or a percentage of the cost of the work. The contract form declares certain types of costs as part of the fee and not costs to be reimbursed. The levels and types of these nonreimbursable costs will vary from project to project and depend upon the nature of the program and the terms negotiated with the contractor.[2]

A cost-plus contract with a fixed fee (lump-sum fee) enables the contractor to produce savings for the owner without penalizing themselves. If, however, a percentage of construction cost is used as the basis for the fee (i.e. fee based on cost alone), the amount of compensation moves up or down with the cost of the project, taking away the incentive to reduce construction costs.[3] This, coupled with the fact that the cost is not

fixed, are the obvious disadvantages of the cost-plus-fee contract to owners. However, few cost-plus-fee agreements are entirely open-ended, and these disadvantages can be mitigated by choosing one of the variations listed below.[4]

Target price with an incentive. To establish a financial incentive for the contractor to save money, a target price for the project may be established. The contract then stipulates that the contractor will share a percentage of the savings below the target price and participate in carrying a percentage of the cost overruns. The target price is based on preliminary contract documents, performance specifications, standard square footage costs, or some combination of these factors.[5]

Partial cost guarantee. Even with a cost-plus-fee contract, contractors can obtain fixed prices and firm quotes from subcontractors and suppliers of equipment and materials. The contractor may include fixed allowances for general conditions work and a fee for overhead and profit. Such partial guarantees reduce risks to both the owner and the contractor.[6]

Cost-plus-fee with a guaranteed maximum price (GMP). A common variation of the cost-plus-fee contract is one in which the contractor performs the work at a fixed fee for his services and also guarantees that the reimbursable costs of the work (the direct costs of the construction work) will not exceed a maximum level.[7] With a certain critical amount of design information, bidders can estimate a maximum cost which, with a lump sum fee, may constitute a bid to do the work under a "maximum cost-plus-fee" contract.[8] Under this form, provisions can also be inserted that allow reduction of actual costs below the level of the guaranteed maximum cost to be divided between the owner and the

contractor in some predetermined manner. When such "cost-savings bonus"[9] (also called a "Sharing Clause"[10]) arrangements are developed, the contractor may have a positive incentive to perform the work as economically as possible. Care must be taken in developing such savings bonus clauses so that the amount of reward does not become so large as to focus the contractor's attention on saving costs to the detriment of quality and workmanship in the building itself.[11]

Advantages of Cost-plus-fee Contracts. Under a maximum (GMP) cost-plus-fee contract, the contractor occupies a quasi-professional position as an adviser to the owner, in which his interest--that of sound, economical, and rapid execution of the work--are the same as the owner's. This contract method is also very useful where ultimate costs, such as occur in alterations or remodeling, cannot be projected with reasonable accuracy until some actual demolition or remodeling work has been accomplished.[12]

Another advantage of the cost-plus-fee contract, and one of the main reasons for its use, is that construction work can start with incomplete design information, allowing for phased construction. With the advent of construction management as a means to phased construction, and with the development of cost estimating techniques applicable early in the design phase of projects, some means of cost limitation can be devised and applied in the absence of complete design information for almost every project. One such means is the maximum cost-plus-fee contract.[13] Since a cost-plus fee contract can be written anytime, it allows for contractor participation during design as well as for work to begin before design is complete.[14]

Cost-plus fee contracts in their simplest form, with no maximum cost and no sharing clause, have only expediency to recommend them. But with a realistic maximum cost and an equitable sharing clause according to the project's circumstances, a maximum cost-plus-fee contract is generally superior to any other kind of contract for large and complex projects with a general contractor. The size of the project, complexity of construction, or difficult site conditions leading to a need for flexibility in decision making, and a project schedule leading to a need for phased construction, are often the reasons to choose a maximum cost-plus-fee contract rather than a lump-sum contract.[15]

NEGOTIATED CONTRACTS

Description. Rather than being an actual form of contract itself, a negotiated contract refers to the way a contract is awarded. Under this method, the contractor is selected mainly on factors other than price. These other factors may include record of performance, demonstrated competency of construction management, and client satisfaction. The widest usage of negotiated contracts has been on large projects and those where the number of qualified contractors available is limited.[16]

The award of a negotiated contract is made on the basis of the known abilities of the contractor in those areas that are important to the project. The solicitation may involve a lump-sum bid for the work, but it is clearly understood that price will not be the dominant factor or criterion for award. Rather, the award will be made on identified factors of performance--quality, schedule, and overall management. The process may not

request a price proposal until the field of available contractors has been narrowed to two or three, or sometimes, a single contractor.[17]

Under a negotiated contract, the contractor may be required to furnish a lump-sum proposal, just as he would under the competitive bidding process. Frequently, however, the negotiations may be conducted for an agreement on a cost-plus-fee contract that might contain a guaranteed maximum price. The selected contractor can be brought into the project at any time that his services are required. This could be at some point during the design work or subsequent to completion of design. The contract documents do not have to have the same degree of detail as that required to conduct competitive lump-sum bids.[18]

Most of the larger contractors that regularly seek negotiated contracts propose that their firm be selected and contracted with prior to the final completion of design. This usually means that negotiations and formal contract execution are accomplished at some point in the working drawings phase of design. This earlier than normal entry time enables the contractor to accomplish some useful tasks such as improved work planning, scheduling, and advanced ordering of long-lead time materials and equipment. The contractor's role, with respect to design review, is less than that expected under the construction management concept. Rather, the contractor is "aboard" and available to undertake whatever tasks are required.[19]

Advantages of Negotiated Contracts. Reduction of the typical adversarial relationship between the owner and the contractor is a major advantage of negotiated contracts. Another primary advantage of negotiating a contract is the greater degree of mutual agreement that can be reached through negotiations. Whatever design information

there is can be communicated much more effectively if oral communication is added to written, and if each point has to be examined, discussed, and agreed to, thus eliminating "gray" areas. Some of the benefits of negotiations may arise even before negotiations begin, since the owner must be prepared with an estimate of costs and other detailed information about the work, and this requires the owner to understand the work and the site in ways which might not otherwise be necessary if the project were to go out for competitive bids.[20]

Suggestions made by the contractor during negotiations may stimulate refinements in the design. Negotiations make it possible for the contractor to ask questions which may remove or settle doubts which otherwise would have led to the inclusion of allowances for contingencies in an estimate prior to submitting a bid. Negotiations enable a contractor to point out problems in the work which the designer might otherwise have been unaware of, and this enables a solution to be sought and possibly found before the work is begun.[21]

Another advantage of negotiations is that they can establish good relations before a contract is made that will serve to make the contract run more smoothly from the beginning, because negotiations may do away with the need for the persons involved to make their initial meetings and adjustments during the period of the contract.[22]

Above all, negotiations enable an owner to make a construction contract with a company selected primarily for its good reputation.[23] With competitive bidding, the low bidder may not be the best qualified, which may lead to the project costing more in the long run. This more than anything else appears as the primary reason for negotiating, rather than calling for bids: to strike a bargain with a construction company whose

reputation assures the owner that they will be free of unnecessary and unreasonable risks arising not from the site or from the work, but from the contractor and the contract[24]

PRIVATIZATION

Description. Privatization is an emerging trend for financing the construction of public works projects.[25] Privatization can be defined as private sector involvement in the design, construction, financing, and operation of a facility which will provide services to the public sector.[26]

Since the private sector has unique advantages not available to local governments, the opportunity exists to capitalize on situations that could result in savings for the community. A private firm undertaking a construction project will generally proceed at a faster rate and with a less cumbersome approach than a project constructed with public funds. The regulations and procedures which must be followed on a publicly funded project typically raise the cost of the project significantly. Bidding procedures, procurement regulations, and other conditions on government projects are intended to protect the public. However, they also delay projects and add cost to the projects.[27]

Formats. Privatization can take a number of different forms. The number applicable to privatizing a military medical facility is, however, limited. In order for privatization to be viable, the private entity must realize a return on its investment. In the extreme case, the private company finances, designs, builds, owns, and operates the facility. This would mean that they actually provide the medical care to the military community. However, this would mean the displacement of thousands of military medical

personnel. Furthermore, the cost to the government, and hence, the taxpaying public, of providing medical care in a military-run facility is generally less than that provided in a private setting.

Another format is referred to as Build-Operate-Transfer (BOT). Under this method, the private entity operates the plant and transfers the ownership to the government after a specified concession period.[28] This allows the project to be built more quickly and inexpensively by the private organization. During the specified period of operation, the private entity keeps any profits and absorbs any losses generated by the facility and its services. This gives them the opportunity to realize a return on their investment before transferring ownership to the government.

A third option is for the private entity to finance, design, and build the project, and then to either rent the building to the government or sell it to the government outright. In this way, the government takes control of the facility at the earliest possible time. The private firm acts much like a developer in this role.

Advantages of Privatization. With privatization, savings can result from the private sector's ability to procure materials using a wide range of contractual options and proceed through design and construction at a much faster rate than the government. In many projects, time savings can be translated into cost savings. Many regard the delays associated with the procedural requirements and approval process of public projects as major factors in increasing the cost of public services, even though the public sector uses the competitive low bid procurement process.[29] Time and cost savings are significant because regulatory involvement is minimized and certain public procurement regulations

avoided. Savings due to these factors often exceed twenty percent of the estimated project cost.[30]

Another advantage of privatization is that the private firm bears the risks related to construction. They will design the project, and therefore will be responsible for any increased costs due to errors or omissions. They will also be responsible for construction defects and failures, cost overruns, and claims.[31]

Privatization offers the potential for time and cost savings, but introduces other concerns in relationship to the provision of the government service. It is therefore more suitable for projects such as highways, bridges, and water treatment facilities. In a critical situation, however, such as replacing a facility destroyed in a natural disaster, it may prove beneficial on projects such as medical facilities.

APPROPRIATENESS OF CONTRACT TYPE TO DELIVERY METHOD

Construction management and design/build are both remarkably flexible in terms of the type of contract that can be used. Virtually any form of contract can be adapted to these approaches.

When a construction manager acts as the owner's agent on a federal project, he would normally have a professional services contract with the owner, similar to that of an A/E firm. This leaves the contracts for construction to be awarded in any manner that the owner sees fit. The traditional method could be used, complete with competitive bidding and awarding a lump-sum contract to the lowest bidder. Multiple prime contracts could

also be awarded in this fashion, thus eliminating the general contractor and his associated overhead.

A cost-plus-fee contract could also be utilized. This would be especially useful if the project were being fast-tracked. Furthermore, a contract could be negotiated for either a fixed price or a cost-plus-fee contract. In any case, with the CM acting as the owner's agent, the owner could manage the contracts, or the CM could manage them on the owner's behalf.

In the CM-at-risk format, the CM assumes the role of general contractor during construction. Since the CM has already been involved with the project during design, however, a negotiated contract is appropriate in this situation. The negotiated contract could still be for a lump-sum or a cost-plus-fee contract. If a cost-plus-fee contract is used, a guaranteed maximum price should be obtained from the CM.

There are several contract options associated with design/build as well. A competitive fixed-price contract can be used, but this requires the owner to develop performance specifications that are then bid on by the design/build firms. This, however, requires that the performance specifications be very clear and reflect every requirement that is important to the owner.[32]

More appropriate for a design/build project would be a negotiated fixed-price contract. The design/build entity is normally paid a fee for schematic design, and a construction cost commitment is made at some point in the design's development.[33]

A negotiated cost-plus-fee contract can also be used with design/build. Once again, a target price or guaranteed maximum price should be included if this method is chosen.

Alternative contracting methods and delivery approaches offer considerable flexibility to the owner. The general criteria that should be used to select the appropriate method of contracting and contract form are:[34]

1. Type of Project.
2. The complexity of the project.
3. Time availability for design and construction.
4. Regulations governing contracting methods.
5. Capabilities and preferences of available contractors.
6. Projected overall costs and financial risk exposure of each method.

All of these criteria must be evaluated by the owner. In a public project, however, it is item number four that usually limits the owner's choices. For this reason, a discussion of the regulations applicable to DoD medical projects is in order, and this will be the topic of the next chapter.

[1] Keith Collier, Construction Contracts (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1987), 80.

[2] William M. Eaves and Peter B. Laubach, Managing Hospital Design and Construction Programs (Chicago: The Foundation of the American College of Healthcare Executives, 1987), 80.

[3] David Haviland, The Architect's Handbook of Professional Practice, Chapter 2.1, "Delivery Approaches" (Washington, D.C.: American Institute of Architects, 1988), 25.

[4] Ibid., 25.

[5] Ibid., 25.

[6] Ibid., 26.

[7] Eaves and Laubach, 80.

[8] Collier, 105.

[9] Eaves and Laubach, 80.

[10] Collier, 106.

[11] Eaves and Laubach, 80.

[12] Ibid., 80.

[13] Collier, 104-5.

[14] Haviland, 25.

[15] Collier, 108.

[16] Eaves and Laubach, 73-4.

[17] Ibid., 74.

[18] Ibid., 74.

[19] Ibid., 74.

[20] Collier, 285.

[21] Ibid., 285.

[22] Ibid., 285.

[23] Ibid., 286.

[24] Ibid., 286.

[25] Harvey J. Goldman and Bruce Greenwald, "Privatization: Financing for Public Works Construction," Constructor, June 1983, 91.

[26] Robert Helmerick, "Privatization's Impact on Traditional Bidding Practice" (A paper submitted for BCN 6621, University of Florida, Summer 1994), 1.

[27] Ibid., 1-2.

[28] Weilin P. Chang, International Construction Contracting, Part II (Class notes for BCN 5776, University of Florida, Fall 1995), 80.

[29] Helmerick, 4.

[30] Goldman and Greenwald, 91.

[31] Helmerick, 4.

[32] Haviland, 15-16.

[33] Ibid., 15.

[34] Eaves and Laubach, 80-81.

CHAPTER 5

The Federal Acquisition Regulation Roadblock

The Federal Acquisition Regulation (FAR) represents the major stumbling block to the use of alternative delivery approaches for federal construction and, specifically, for military medical construction projects. This chapter will discuss the requirements of the FAR in relation to contracting for construction and architectural-engineering services, specifically for Department of Defense projects. Also, the intent of the FAR requirements will be discussed. Furthermore, an attempt will be made to show how the intent of the FAR can be met while using alternative delivery approaches.

REQUIREMENTS OF THE F.A.R. - CONSTRUCTION CONTRACTS

As previously mentioned in Chapter Two, the FAR provides uniform policies and procedures for acquisitions by executive agencies of the federal government. The Federal Acquisition Regulation System consists of the FAR, which is the primary document, and agency acquisition regulations that implement or supplement the FAR. For the military departments and defense agencies, this means the Department of Defense FAR Supplement (DFARS).

Part 36 of the FAR and Part 236 of the DFARS concern "Construction and Architect-Engineer Contracts." These parts will serve as the basis for our discussion. Other sections will be discussed as they are referenced in Parts 36 and 236, or as

otherwise applicable. (For a summary of the requirements discussed in this chapter, refer to Appendix D.)

Selection. Section 36.103, "Methods of contracting," states:

> (a) Contracting officers shall acquire construction using sealed bid procedures if the conditions of 6.401(a) apply, except that sealed bidding need not be used for construction contracts to be performed outside the United States, its possessions, or Puerto Rico. (See 6.401(b)(2).)[1]

Section 6.401 referenced in the above section falls under Part 6 of the FAR, which deals with "Competition Requirements." Section 6.401, entitled "Sealed bidding and competitive proposals" states in part:

> (a) *Sealed Bids.* Contracting Officers shall solicit sealed bids if-
>
> (1) Time permits the solicitation, submission, and evaluation of sealed bids;
> (2) The award will be made on the basis of price and other price-related factors;
> (3) It is not necessary to conduct discussions with the responding offerors about their bids; and
> (4) There is reasonable expectation of receiving more than one sealed bid.
>
> (b) *Competitive Proposals.*
>
> (1) Contracting officers may request competitive proposals if sealed bids are not appropriate under paragraph (a) above.
> (2) Because of differences in areas such as law, regulations, and business practices, it is generally necessary to conduct discussions with offerors relative to proposed contracts to be made and performed outside the United States, its possessions, or Puerto Rico. Competitive proposals will therefore be used for these contracts unless discussions are not required and the use of sealed bids is otherwise appropriate.[2]

It is apparent that sealed bidding, the procedure used in the traditional design-bid-build process, is generally the required method for procuring construction

services for stateside projects. Negotiated contracts, however, seem to be preferred for overseas projects.

Contracting. Section 36.207 of the FAR is entitled "Pricing fixed-price construction contracts." This section states:

> (a) Generally, firm-fixed-price contracts shall be used to acquire construction. They may be priced (1) on a lump-sum basis (when a lump sum is paid for the total work), (2) on a unit-price basis (when a unit price is paid for a specified quantity of work units), or (3) using a combination of the two methods.[3]

Since unit-price contracts are inappropriate for medical facilities, it would appear the only choice is to use a lump-sum contract. But note the word *"Generally."* This wording implies that although lump-sum contracts may be the preferred method, they are not necessarily the *required* method. As will be shown, other contracting options are available to the contracting officer.

Section 36.403 of the FAR addresses the use of cost-reimbursement contracts for construction. It reads:

> Contracting officers may use a cost-reimbursement contract to acquire construction only when its use is consistent with Subpart 16.3 and Part 15.[4]

Part 15 of the FAR deals with "Contracting By Negotiation." Any contract awarded without using sealed bidding procedures is a negotiated contract.[5] Any cost-reimbursement contract would therefore be a negotiated contract.

Part 16 of the FAR is entitled "Types of Contracts." It describes the types of contracts that may be used in acquisitions. The contracts are grouped into two broad

categories: fixed-price contracts and cost-reimbursement contracts.[6] Section 16.101 states:

> (a) A wide selection of contract types is available to the government and contractors in order to provide needed flexibility in acquiring the large variety and volume of supplies and services required by agencies.[7]

Section 16.103, paragraph (a), states "Selecting the contract type is generally a matter for negotiation and requires the exercise of sound judgment."[8] Paragraph (b) goes on to say:

> A firm-fixed-price contract . . . shall be used when the risk involved is minimal or can be predicted with an acceptable degree of certainty. However, when a reasonable basis for firm pricing does not exist, other contract types should be considered, and negotiations should be directed toward selecting a contract type (or combination of types) that will appropriately tie profit to contractor performance.[9]

Section 16.104 lists the factors to be considered in selecting the type of contract to be used. These factors include price competition; price analysis; cost analysis; type and complexity of the requirement; urgency of the requirement; period of performance or length of production run; contractor's technical capability and financial responsibility; adequacy of the contractor's accounting system; concurrent contracts; and extent and nature of proposed subcontracting.[10]

Subpart 16.3 is entitled "Cost-Reimbursement Contracts." Section 16.301-2 states "Cost-reimbursement contracts are suitable for use only when uncertainties involved in contract performance do not permit costs to be estimated with sufficient accuracy to use any type of fixed-price contract."[11] Section 16.301-3 continues:

A cost-reimbursement contract may be used only when-

(a) The contractor's accounting system is adequate for determining costs applicable to the contract; and
b) Appropriate Government surveillance during performance will provide reasonable assurance that efficient methods and effective cost controls are used.[12]

Subpart 16.3 goes on to describe several different types of cost-reimbursement contract types available to the contracting officer. These include: cost contracts; cost-sharing contracts; cost-plus-incentive-fee contracts; cost-plus-award-fee contracts; and cost-plus-fixed fee contracts.[13] Section 16.301-1 states that these types of contracts " . . . establish an estimate of total cost for the purpose of obligating funds and establishing a ceiling that the contractor may not exceed (except at its own risk) without the approval of the contracting officer."[14]

Under certain circumstances, therefore, cost-reimbursement type contracts can be used. The DFARS, however, adds another restriction. Section 236.271 of the DFARS states:

Annual military construction appropriations acts restrict the use of cost-plus-fixed-fee contracts for construction and A-E services. The Assistant Secretary of Defense (Production and Logistics) must specifically approve such contracts in writing when-

(a) They are estimated to exceed $25,000;
(b) They will be performed within the U.S., except Alaska; and
(c) They are funded by a military construction appropriation act.[15]

From the wording of the sections quoted above, it appears that although various contracting methods are available for construction contracts, sealed bidding and lump-sum contracts are the methods that are felt to be most advantageous to the government.

Whether or not this is actually the case is open to debate. Other methods are to be used only under certain circumstances and with specific approvals.

One other aspect of the FAR dealing with construction contracts needs to be covered. Section 36.209 of the FAR is entitled "Construction contracts with architect-engineer firms." It states:

> No contract for the construction of a project shall be awarded to the firm that designed the project or its subsidiaries or affiliates, except with the approval of the head of the agency or authorized representative.[16]

This section appears to rule out the possibility of using design/build, since the same entity would accomplish both the design and construction. Once again, however, the wording leaves the door open. Design/build could be used given the appropriate level of approval.

REQUIREMENTS OF THE F.A.R. - A/E CONTRACTS

Selection. The procedures for acquiring architect-engineer services is entirely different from that of acquiring construction services. FAR section 36.103 states:

> (b) Contracting officers shall acquire architect-engineer services by negotiation, and select sources in accordance with applicable law, Subpart 36.6, and agency regulations.[17]

Subpart 36.6, entitled "Architect-Engineer Services," prescribes the applicable policies and procedures. Section 36.601-1 reads:

> The Government shall publicly announce all requirements for architect-engineer services and negotiate contracts for these services based on the demonstrated competence and qualifications of prospective contractors to perform the services at fair and reasonable prices.[18]

This method of selection is known as "qualifications-based selection" (QBS). This procedure is based on the Brooks Act, enacted by Congress in 1972. The act determines how contracts for design services can be awarded by federal agencies. It declares that the policy of the federal government is to negotiate on the basis of "demonstrated competence and qualification for the type of professional services required and at fair and reasonable prices."[19]

Section 36.602-1 sets forth the selection criteria for A/E contracts. It states:

> (a) Agencies shall evaluate each potential contractor in terms of its-
>
> (1) Professional qualifications necessary for satisfactory performance of required services;
> (2) Specialized experience and technical competence in the type of work required;
> (3) Capacity to accomplish the work in the required time;
> (4) Past performance on contracts with government agencies and private industry in terms of cost control, quality of work, and compliance with performance schedules;
> (5) Location in the general geographical area of the project and knowledge of the locality of the project; *provided*, that application of this criterion leaves an appropriate number of qualified firms, given the nature and size of the project; and
> (6) Acceptability under other appropriate evaluation criteria.[20]

Section 36.602-1 continues by allowing evaluation of firms on the basis of their conceptual designs, through design competitions, when approved by the agency head.[21]

The DFARS elaborates on A/E selection criteria. Section 236.602-1 states:

> (6) The primary factor in A/E selection is the determination of the most highly qualified firm. Also consider secondary factors such as geographic proximity and equitable distribution of the work, but do not attribute greater significance to the secondary factors than to qualifications and past performance. Do not reject the overall most highly qualified firm solely in the interest of equitable distribution of contracts.[22]

Nowhere in the above criteria for selecting A/E firms is price included as a determining factor. The overriding concern is with the ability of the firm to accomplish the work.

Contracting. As previously stated, A/E contracts are negotiated contracts, generally for a lump sum. These contracts are subject to a statutory fee limitation. DFARS section 236.606-70 states:

> (a) 10 United States Code (U.S.C.) 4520, 7212, and 9540 limit the contract price (or fee) for A-E services for the preparation of designs, plans, drawings, and specifications to six percent of the project's estimated construction cost.[23]

The selected firm is sent a Request for Proposal (RFP). The proposal indicates the amount the firm is offering to do the work for. The designated design agent prepares a separate Government Estimate (GE), which is based upon the projected resources required to complete the design. The firm and the government meet to discuss the differences in the proposal and the GE, and to negotiate the final contract amount. This amount, however, cannot exceed the six percent statutory limit.

INTENT OF THE F.A.R.

The intentions of the FAR can be grouped into two general categories: 1) to promote full and open competition; and 2) to procure goods and services at the least cost to the government (and hence the taxpaying public).

Section 6.101 of the FAR deals with policy regarding competition. It reads:

> (a) 10 U.S.C. 2304 and 41 U.S.C 253 require, with certain exceptions, that contracting officers shall promote and provide for full and open competition in soliciting offers and awarding government contracts.
>
> (b) Contracting officers shall provide for full and open competition through use of the competitive procedure or combination of competitive procedures contained in this subpart that is best suited to the circumstances of the contract action. Contracting officers must use good judgment in selecting the procedure that best meets the needs of the government.[24]

This policy is fairly straightforward. It provides everyone with a chance to work on government contracts, without any discrimination.

The intention of procuring goods and services at the least cost needs little explanation or justification. This is a basic responsibility of the government. Any actions that are construed as not meeting this criteria are met with accusations of fraud, waste, and abuse by the taxpaying public.

In light of these broad criteria, why is it that construction contracts are solicited and awarded differently than A/E contracts? The basic answer is that in the eyes of the government, A/E services are considered "professional services," while construction services are not. The question, however, deserves further attention. The criteria for selecting an A/E firm appears to be a logical way of selecting the best qualified firm for the job, with subsequent negotiations to assure that a fair price is paid by the government. So why aren't contracts awarded to construction companies in the same way? And why aren't the same steps taken to assure that the best company gets the job?

Award of a construction contract, while based primarily on price, must in fact be made to a "responsible" bidder. Section 14.407-1 of the FAR, dealing with the award of sealed bid contracts, states:

(a) The contracting officer shall make a contract award . . . to that responsible bidder whose bid, conforming to the invitation, will be most advantageous to the Government, considering only price and the price-related factors included in the invitation.[25]

Section 14.407-2 states:

(a) The contracting officer shall determine that a prospective contractor is responsible and that the prices offered are reasonable before awarding the contract.[26]

Part 9 of the FAR deals with contractor qualifications. Section 9.103 states:

(a) Purchases shall be made from, and contracts shall be awarded to, responsible prospective contractors only.
(b) No purchase or award shall be made unless the contracting officer makes an affirmative determination of responsibility. In the absence of information clearly indicating that the prospective contractor is responsible, the contracting officer shall make a determination of nonresponsibility.
(c) The award of a contract to a supplier based on lowest evaluated price alone can be false economy if there is subsequent default, late deliveries, or other unsatisfactory performance resulting in additional contractual or administrative costs. While it is important that Government purchases be made at the lowest price, this does not require an award to a supplier solely because that supplier submits the lowest offer. A prospective contractor must affirmatively demonstrate its responsibility, including, when necessary, the responsibility of its proposed subcontractors.[27]

So, while the contracting officer can disqualify the lowest bidder because he is not "responsible," this rarely happens. Significant (if not overwhelming) justification must be given for the disqualification. The stigma associated with this type of action is indeed great. Not only will the contracting officer be required to defend his decision, but the disqualified bidder will probably challenge the decision. The fact that the lowest bidder did not get the job can lead to a public outcry of government waste. Add to this the

associated negative publicity, and it is not difficult to see why the contracting officer may be reluctant to disqualify the lowest bidder.

Construction contracts, therefore, are usually awarded to the responsible bidder that gives the best price. The construction company selected, however, may not be the best qualified for the job. This fact may, in the long run, actually cost the government more money.

A/E contracts, on the other hand, are awarded to the most qualified firm, and a fair price is negotiated. This procedure, while acquiring the best firm for the job, may not yield the best price.

This brings us back to the original question, namely, why are these contracts awarded differently? The most likely answer is because "that's the way its always been done." People in general, and governments in particular, are slow to adapt to change. Furthermore, attempts to change the system of qualifications-based selection for A/E contracts has resulted in strong disapproval by the professional design groups, particularly the American Institute of Architects (AIA). There has, however, been considerable support for the prequalification of construction contractors, similar to that required of A/E firms. Section 236.272 of the DFARS states:

> (a) Prequalification procedures may be used when necessary to ensure timely and efficient performance of critical construction projects. Prequalification-
>
> (1) Results in a list of sources determined to be qualified to perform a specific construction contract; and
> (2) Limits offerors to those with proven competence to perform in the required manner.[28]

Another possible reason for the difference in contracting methods is that licensed architects and engineers are considered "professionals," and as such should compete with each other on the basis of qualifications (rather than price), with the assumption that a fair price can be negotiated with these professional people. Or possibly the answer lies in the dollar amount of the contracts. Since the A/E fee is only a small percentage of the construction contract, price may not be considered the driving factor. However, since the construction contract represents a much larger expenditure of funds, price becomes the overriding concern.

Whatever the case may be, the intent of the FAR remains to provide for selective award of A/Es and open competition of contractors to procure goods and services at the least possible cost.

MEETING THE INTENT OF THE F.A.R. WITH ALTERNATIVE DELIVERY APPROACHES

Construction Management. The CM-agency format offers the simplest way of meeting the requirements of the FAR. The CM could be treated in virtually the same manner as the A/E firm. In this capacity, the CM is not actually acting as an agent (this role is still filled by the COE or NAVFAC), but rather as a consultant to the owner. Since the CM would be providing professional services for a fee, the firm could be selected based on qualifications, and the contract subsequently negotiated. The CM services could be utilized solely during the design phase, or he may participate during construction as well. If he does participate during construction, he remains an advisor to the owner,

working for a negotiated fee. The construction contract would be awarded in the traditional manner to a general contractor.

Another possibility in the CM-agency format is the elimination of the general contractor and his associated overhead and profit. The CM would still provide professional services for a fee, and some of those services would be the coordination and award of multiple prime contracts. These contracts would still be competitively bid in accordance with the FAR; there would just be more than one contract. The contracts would remain directly between the government agent and the multiple contractors. With the CM on the job, however, coordination would be provided without the need for a general contractor.

The CM-at-risk format would need to be handled in a different way. Since the CM would be acting in the role of a general contractor, presumably he would have to be selected through competitive bidding. But since one of the major advantages of construction management is the CM's participation during the design process, firms could hardly be asked to bid on a project that has not been designed. However, the CM could be brought in at some point in the design that would allow him to accurately estimate construction costs in order to give a guaranteed maximum price. Ideally, the design would be at a point that would allow the CM to estimate costs accurately, while still leaving enough time for meaningful design-phase input. An appropriate time might be at the end of the design development phase, when the scope of the project is fixed, just before the working drawing phase has begun. CM firms could competitively bid on the projects, with the responsible firm offering the lowest price, or guaranteed maximum price

(GMP), being awarded the contract. Services provided during the design phase would be negotiated separately from the construction contract.

Design/Build. The first step in using design/build is for the appropriate agency to approve the use of this method, as discussed above. In terms of selecting and contracting with a design/build firm, there are several possibilities. Design/build firms can be selected competitively, proposing the design and construction price simultaneously. This method requires that a clear scope of work be presented to the prospective bidders. At the conclusion of the design development stage, a GMP can be provided.

Another option would be to hire an A/E firm to accomplish the design through the design development stage, and then to solicit bids from design/build firms for the working drawings phase and construction. The bids could be in the form of a lump-sum or a GMP. This method, however, is not as desirable as the first option, having the same effect but dividing the design between two firms. The advantages of design/build would be better realized if the same firm controlled the entire process.

A third possibility is to negotiate the design and construction contracts separately. The firm would be chosen based on its qualifications, and a contract negotiated for design. Near the conclusion of the design phase, a decision could be made as whether to negotiate a contract with the design/build firm for construction, or to competitively bid the project in the traditional fashion.

Contracting. Whether awarding a contract to a CM or to a design/build firm, a lump-sum contract can be used. However, asking the firms to provide a GMP offers the

possibility of the project being built for less than the GMP. With a lump-sum contract, the contractor gets paid the lump-sum regardless of what the project eventually costs.

A contract including a GMP is generally in the form of a negotiated cost-plus-fee contract. As discussed in Chapter Four, this arrangement, with the inclusion of a sharing clause and a lump-sum fee, gives the contractor a positive incentive for performing the work as economically as possible. However, the requirements of the FAR for using a cost-plus-fee contract must be met.

Some aspects of DoD medical projects would seem to fit the needs for a cost-plus-fee contract. Refer again to some of the factors listed in Section 16.104 (presented earlier in this chapter):

- *Risk involved is minimal or can be predicted with an acceptable degree of certainty.* The risk involved in a DoD medical project cannot be considered minimal given the history of these projects, as was pointed out in Chapter One.

- *Type and complexity of the requirement.* Medical projects are extremely complex, increasing the risk factor.

- *Period of performance.* The length of time it takes to build a typical project points to the need for a contract that is sensitive to inflation.

- *Extent and nature of proposed subcontracting.* Subcontracting is extremely extensive in any construction project, especially for a medical facility.

The main criteria for the use of a cost-plus-fee contract, that of not being able to accurately estimate costs, could be viewed in different ways. In one sense, the fact that the project must be awarded for less than the Programmed Amount provides a certain

degree of cost control and fairly accurate estimating. However, given the amount of change orders and cost overruns inherent in DoD medical projects, final costs are often well in excess of their original estimate.

It would seem then, that the ultimate decision on what type of contract to use comes down to the contracting officer and his evaluation of the specific project (given the approval of the Assistant Secretary of Defense for Production and Logistics). Unfortunately, most contracting officers do not want to "rock the boat" by trying anything but a competitive bid, unless there is a very good reason (such as the support of a General Officer). However, a decision made in good faith to use a cost-plus-fee contract would presumably meet the intent of the FAR.

A guaranteed maximum price provided by a CM or design/build firm provides a logical tie-in with the Programmed Amount for a project. Under a fixed budget, the owner sets the total costs and asks the firm to provide a building within that budget. A fixed budget allows firms to prepare proposals on a level playing field. When a fixed budget is specified, firms can be evaluated on the value they can supply within the budget. At the same time, by fixing the project's budget, the owner has also controlled the cost of the project.[29] A GMP that is below the PA for a project provides as much assurance that the project will be delivered under budget as a lump-sum contract.

CM and design/build can in fact meet the general requirements of the FAR. Selection of firms can provide for full and open competition. And the advantages of CM and design/build outlined in Chapter Three point to the fact that these methods can meet

the requirement of delivering the project at the least cost to the government. While the traditional use of design-bid-build and lump-sum projects has been thought to shift the risks involved to the contractor, the fact is that inaccurate estimates and other shortcomings of the traditional process simply lead to contractors including large contingencies in their bids to cover the risks. This practice does nothing to save the government money, and in many cases, purposely drives competent contractors away, achieving the opposite effect.

Furthermore, the FAR is merely a regulation; it is not written in stone. The FAR itself, in section 1.402, states:

> Unless precluded by law, executive order, or regulation, deviations from the FAR may be granted as specified in this subpart when necessary to meet the specific needs and requirements of each agency. The development and testing of new techniques and methods of acquisition should not be stifled simply because such action would require a FAR deviation. The fact that deviation authority is required should not, of itself, deter agencies in their development and testing of new techniques and acquisition methods.[30]

The FAR is also constantly under revision, and agencies can propose appropriate revisions to the document.

Some progress has already been made. Several federal agencies are successfully using the design/build process, as will be discussed in Chapter Six. And beginning in fiscal year 1992, Congress permitted unlimited use of design-build by all military agencies (with departmental approval required on a project-by-project basis).[31]

The task, then, is for forward-looking managers to realize that changes should be made to incorporate the use of alternative delivery and contracting approaches for military medical construction projects, and to take the appropriate actions to make this possible.

[1] Federal Acquisition Regulation (Chicago, IL: CCH Incorporated, 1995), 18,272.
[2] Ibid., 16,188.
[3] Ibid., 18,274.
[4] Ibid., 18,277.
[5] Ibid., 16,911.
[6] Ibid., 17,037.
[7] Ibid., 17,037.
[8] Ibid., 17,037.
[9] Ibid., 17,037.
[10] Ibid., 17,038.
[11] Ibid., 17,043.
[12] Ibid., 17,043.
[13] Ibid., 17,043-44.
[14] Ibid., 17,043.
[15] Department of Defense FAR Supplement (Chicago, IL: CCH Incorporated, 1995), 24,004.
[16] Federal Acquisition Regulation, 18,274.
[17] Ibid., 18,272.
[18] Ibid., 18,281.
[19] Justin Sweet, Legal Aspects of Architecture, Engineering, and the Construction Process (St.Paul, MN: West Publishing Company, 1994), 181.
[20] Federal Acquisition Regulation, 18,282.
[21] Ibid., 18,282.
[22] Department of Defense FAR Supplement, 24,006-7.
[23] Ibid., 24,008.
[24] Federal Acquisition Regulation, 16,180.
[25] Ibid., 16,783.
[26] Ibid., 16,784.
[27] Ibid., 16,389.
[28] Department of Defense FAR Supplement, 24,004.
[29] AIA/AGC Recommended Guidelines for Procurement of Design-Build Projects in the Public Sector (Washington, D.C.: American Institute of Architects and Associated General Contractors of America, 1995), 9.
[30] Federal Acquisition Regulation, 16,018.
[31] "ASCE Reports on Federal Use of Design-Build," Federal Contracts Report, June 1, 1992.

CHAPTER 6

Recommendations & Conclusions

It has now been established that alternative delivery approaches would in fact be beneficial for military medical projects. It has also been shown that these methods can be used while still meeting the intent of public regulations.

This chapter will offer a few recommendations on the best way to apply alternative delivery approaches to military medical projects. This will be followed by a review of the advantages of construction management and design/build through a comparative matrix of these two methods and the traditional design-bid-build process. Also, a look at what is already being done in the public sector with alternative delivery approaches, specifically the Government Services Administration's (GSA) use of design/build, will be set forth.

RECOMMENDATIONS

Given the fact that due to the congressional funding process, construction of a project cannot begin until a given fiscal year, the question may be asked: "Why not take the full two years to design the project?" This is indeed a valid point. Unless the process is modified in some way so as to make design and construction funds available at the same time, there is really no point in trying to shorten the design time of a project, and the benefits of fast-tracking cannot be utilized. (Splitting of the design and construction funds is one of the benefits of the traditional process; a project can be designed and then "shelved" for years with only an update needed when construction is funded.) This fact

underlies the recommendations for the use of construction management and design/build outlined below. The benefits of CM and design/build can still be used to shorten the construction time. It is highly recommended, however, that the funding process be modified in some way. Only then can the full benefits of alternative delivery approaches be realized, and projects delivered in the shortest amount of time possible.

The following are specific recommendations of this report, and are discused in greater detail in the paragraphs that follow.

1. The Department of Defense should explore the use of Construction Managers and the Construction Management process in the procurement of medical facilities.

2. The Department of Defense should consider the use of Design/Build for the procurement of medical facilities when time is an overriding concern.

3. The Department of Defense should consider the use of maximum cost-plus-fee contracts (with a lump-sum fee) and a sharing clause when awarding construction contracts for medical facilities.

4. The Department of Defense should make standard the practice of prequalifying contractors for medical facility projects.

Construction Management. It is the opinion of the author that construction management offers the greatest benefits to the government. Furthermore, this approach can be easily implemented, and can be used without any major disruption to the way government employees are used to working. This can be accomplished through the CM-Agency (consultant) format. The CM should be brought in at the onset of design, at the same time as the designer, in order to realize maximum benefits. The CM contract would be a professional services contract for a negotiated fee. This fee normally amounts to 1-2 percent of the estimated construction cost, but since the designer's fee could be

reduced, the overall expenditure would remain at approximately six percent. The contract for construction would then be competitively bid in the usual manner. While a lump sum contract could be used for construction, it is recommended that a maximum cost-plus-fee contract (with a lump-sum fee) with a sharing clause be awarded. This type of contract can still be competitively bid, but gives the contractor an incentive to save money. This approach retains the benefits of the traditional system, while at the same time reaps the benefits of the construction manager's expertise during both design and construction. The coordination and continuity provided by the CM would significantly reduce the problems typically encountered during construction of a DoD medical project, thereby shortening the construction phase. Furthermore, the project would be built as economically as possible.

Design/Build. The design/build approach should be used when time is the overriding concern. This could be for an emergency project; for example, to replace a facility destroyed by a natural disaster. It could also be to fulfill an immediate need, such as a requirement generated by the DoD's Base Realignment and Closure (BRAC) process. These situations represent instances when funding for both design and construction are immediately available. When design/build is used, firms should be evaluated on qualifications as well as price. The selected firm should be paid a fee for schematic design. At the end of the conceptual design phase, a negotiated cost-plus-fee contract with a guaranteed maximum price and a sharing clause should be awarded. This process would secure all of the benefits of design/build while procuring the project at the least cost for the owner.

Whether using construction management or design/build, it is also recommended that the government make standard the practice of prequalifying contractors. The time has passed for contracts to be awarded on the basis of price alone, and only by utilizing qualified contractors will the government be assured of receiving the most value for its money.

COMPARISON OF APPROACHES

To better understand the similarities and differences of the various approaches, the matrix shown in Figure 6.1 provides a side-by-side comparison of their characteristics. The characteristics are grouped into cost, time, and quality categories. These categories represent the three main objectives of all construction projects: to provide a quality product, on time and within budget.

Figure 6.1 gives a clear indication of the direct benefits of construction management and design/build when compared to the traditional design-bid-build approach.

Comparisons of project delivery methods have also come from executives of large general contracting firms. These industry representatives believe that the competitive, lump sum approach is very workable and practicable when the building project is fairly simple and there is plenty of time to design and then build. In other words, time for completion of the project is no problem. Implicit in this requirement for simple, straightforward construction is that all elements of the building can be determined and expressed in the working drawings, and it is anticipated that only a minimum number of changes would occur.[1] This description is hardly applicable to the typical military medical

	Likelihood of Meeting Objective		
	Traditional	**CM**	**Design/Build**
Cost Objectives			
Cost can be competitively bid	High	High	Medium
Guaranteed Maximum Price can be provided	Low	High*	High
Cost input provided during design by someone with construction expertise	Low/Med.	High	High
Responsiveness to quickly changing market conditions	Low	Medium	High
Project can be divided into bid packages	Low**	High	High
Time Objectives			
Design and construction can be overlapped	Low	Med./High	High
Scheduling input is provided during design by someone with construction expertise	Low/Med.	High	High
Quality Objectives			
A system of checks and balances exists between design and construction	High	High	Low
Input on quality is provided during design by someone with construction expertise	Low/Med.	High	High
Single point of responsibility	Low	Low	High

* In CM-at-risk format
** Only with additive/deductive alternates

Figure 6.1: Comparison of Delivery Approaches[2]

project. On the other hand, these executives feel that construction management with guaranteed maximum cost provisions is the most practical approach for large complex buildings such as a major hospital expansion or addition, particularly where time is limited and total cost can affect the ultimate design. These executives state, almost unanimously, that the construction manager should become involved in the project at the earliest possible time.[3]

CURRENT USE OF ALTERNATIVE DELIVERY APPROACHES IN THE PUBLIC SECTOR

Although the construction management concept has seen limited use among federal agencies, the use of design/build has experienced increasing use over the past few years. The Defense Authorization Bill that was recently signed includes an acqusition reform package. This legislation authorizes federal agencies to use a limited form of design/build construction contracts. The bill creates a two-phase process for the selection of design/build firms. The first phase is the development of a scope of work, which can be accomplished by the agency or contracted out to a private firm. The second phase includes technical submissions from "the most highly qualified offerors." These submissions contain cost and price information as well. The agency then awards the contract to one of the offerors based on standard sealed-bid requirements.[4]

In the military, design/build is being used to accomplish projects brought about by DoD's Base Realignment and Closure. A $64.5 million design/build contract was recently awarded for a Naval Air Systems Command headquarters and garage. The Navy is fast-tracking all of its BRAC projects.[5]

The Air Force is using design/build to procure ninety-eight units of Military Family Housing at Keesler AFB, Mississippi.[6] And the U.S. Postal Service is also using design/build for approximately half of its projects. The Postal Service has expressed enthusiasm about their experience with design/build, and are happy with the results.[7]

The biggest user of design/build in the public sector, however, has been the GSA. GSA began experimenting with design/build in the late 1980s, hoping to copy the private sector's success with this delivery method. Design/build seemed an appropriate way of removing complex design and management decisions from the bureaucracy.[8] In fiscal year 1991, of the $1.719 billion spent on capital construction, $577 million (33 percent) was accomplished using design/build. The agency's policy is that design/build will be given equal consideration with traditional project delivery during project development. Decisions as to which method to use are based upon an analysis of suitability, cost avoidance, and time savings.[9] GSA indicates that they like the single point of responsibility with design/build, and that it has had a significant impact on cost containment.[10]

GSA has recently completed several major projects using design/build, totaling more than $800 million. The Federal Office Building at Foley Square in New York City is a 475 foot tall, one million square foot building. It was built for a cost of $276 million. The Foley Square Courthouse, a $300 million project, is a twenty-seven story building of 921,000 square feet. It was designed and built in forty months. The United States Courthouse in Shreveport, Louisiana, is a 242,000 square foot project that was designed and built in twenty-four months at a cost of $24 million. The Federal Courthouse in White

Plains, New York, is a seven-story, 157,000 square foot building. The 900,000 square foot Health Care Financing Administration Headquarters in Baltimore County, Maryland, was completed in 1995. And the Internal Revenue Service National Headquarters in New Carrollton, Maryland, is a 1.1 million square foot, $125 million project currently under construction.[11]

Although these projects may not represent the complexity of a medical facility, their scope is much larger than a typical DoD medical project. The successful completion of these projects indicates that alternative delivery approaches can be appropriate in the government context.

CONCLUSIONS

Having shown the benefits of alternative delivery approaches for military medical construction projects, and considering the fact that construction management and design/build have been around for many years, one might ask the question: "Why aren't these methods used?" One of the major reasons is simply the human tendency to resist change. With the traditional approach, each player knows his role and is comfortable with it. He understands the status quo. With a new approach, the roles overlap; some take on new responsibilities, teamwork is essential, and the required changes can be the source of hidden fears. These hidden fears result in frustration and insecurity and the desire on the part of some to fight "reason."[12]

Regardless of the resistance to change, it is incumbent upon the leadership in the field of DoD medical construction to utilize the best and latest technologies that are

available in the industry. If a better way exists to deliver military medical projects, it must be used. If this requires modification to existing rules or regulations, then so be it. We must not lose sight of the ultimate goal by being distracted by various obstacles along the way. It is the author's firm belief that construction management and design/build offer a better way to deliver military medical projects, and in that regard, their immediate use is highly recommended.

[1] William M. Eaves and Peter B. Laubach, Managing Hospital Design and Construction Programs (Chicago: The Foundation of the American College of Healthcare Executives, 1987), 81.

[2] John Grattendick, Project Delivery Approaches: Different Options, Different Objectives (Chicago: American Society for Hospital Engineering of the American Hospital Association, 1990), 13.

[3] Ibid., 81.

[4] Michael Charles, "Congress Approves New Design-Build Law," Civil Engineering, March 1996, 100.

[5] Tom Ichniowski, "The Peace Dividend? It's Real," Engineering News Record, April 3, 1995, 10.

[6] "Design/Construct (Design/Build) Military Family Housing at Keesler AFB," Commerce Business Daily, June 19, 1995.

[7] Jane Edmunds, "Design-Build Gaining Ground," Engineering News Record, February 3, 1992, 12.

[8] "Federal Design/Build," Architecture, October 1994, 109.

[9] "ASCE Reports on Federal Use of Design-Build," Federal Contracts Report, June 1, 1992.

[10] "Federal Design/Build," 109.

[11] Ibid., 110-115.

[12] Kwaku A. Tenah, The Construction Management Process (Reston, VA: Prentice-Hall, Inc., 1985), 97.

APPENDICES

APPENDIX A

The Planning/Programming Process

To begin our discussion of the DoD medical facility planning/programming process, refer to Figure A-1. This is a sample timeline for a typical FY 1995 Military Construction Project (MCP). This sample will be used to aid our discussion.

Planning provides the basis for the development of facility projects. Planning may be divided into two major areas: health planning and facility planning. Both are necessary to achieve the appropriate health care delivery option at a specific location. Health planning is the joint responsibility of offices within the Office of the Assistant Secretary of Defense for Health Affairs [OASD(HA)] and the military departments, and produces the inputs necessary for facility planning. The Defense Medical Facilities Office (DMFO) has the primary responsibility for facility planning and the development of facility projects.[1]

Referring to figure A-1, our sample project shows the need for a new facility was identified in January 1987. This "need" is usually identified through a formal report that documents the shortcomings of the existing facility, such as a Facility Utilization Study (FUS). Since these reports require time for investigation, documentation, and preparation, the actual need was probably recognized in 1986, if not earlier. Once the need is identified, steps are undertaken to determine the size and cost of a new facility. This obviously requires an analysis of all the factors that affect the delivery of health care at that location, including catchment area, patient population and demographics, current and projected staffing, and current and projected workloads by department. This information

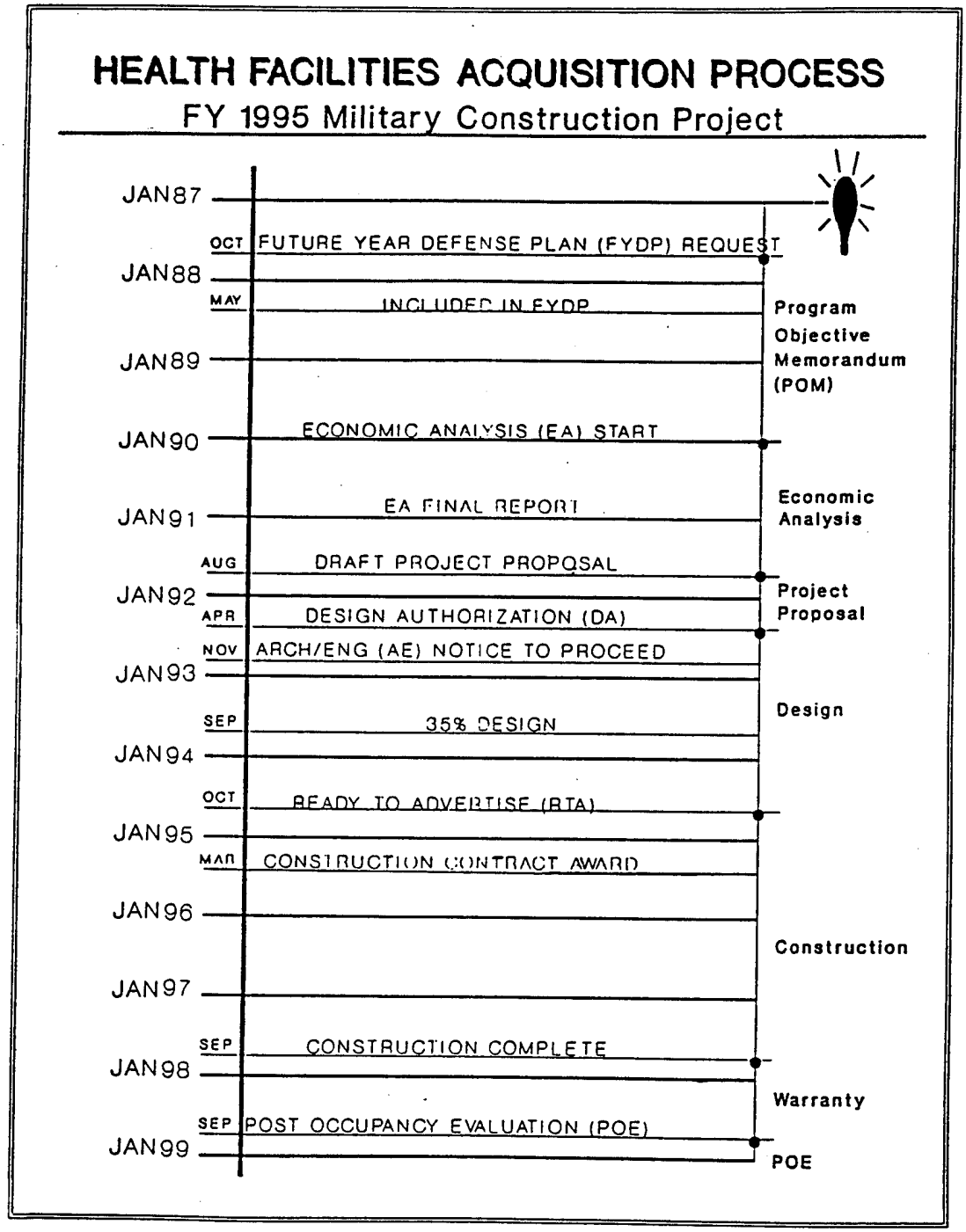


Figure A-1: Project Timeline[2]

is normally gathered directly from the staff at the existing facility by means of a "Medical MILCON Hospital Questionnaire." This document includes over one hundred pages, and is filled out by representatives of every department in the facility. Information is provided for current staffing and workload as well as projected staffing and workload for the year of planned completion of the project. A typical page of the questionnaire for a single department is shown in Figure A-2. Once this information is compiled, it is sent to the Regional Health Facilities Office. The information is then run through a computer program known as the "Facilities Planning Model." This program takes the information and produces a Program For Design (PFD), which is a room-by-room listing of the space authorized for a replacement facility. The PFD (which is based upon DoD Medical Space Planning Criteria) provides the initial scope of the facility.

After the size has been determined, the cost of the project must be considered. Initial cost estimates are very simplistic, which probably accounts in large part for the funding problems that are experienced on many projects. A unit cost per square foot is used based on the type of facility (medical center; hospital; clinic; etc.). These unit costs are published annually by the engineering function of each of the services. This base cost is then modified with a cost growth factor, a size adjustment factor, and an area cost factor. The new cost per square foot is multiplied by the size of the facility to determine the requested amount that will be forwarded up the chain of command and eventually seek congressional approval and funding.[3]

Once size and cost are known, the proper paperwork must be initiated at the base level to formally request that a project be inserted into the program. The medical facility

NURSING SERVICE

Write the WORKLOAD for the most recently completed fiscal year in the spaces provided. If data has been provided, verify and make appropriate changes (citing references).

PLEASE USE A CONTRASTING INK COLOR

NURSING SERVICES WORKLOAD

	Annual Bed Days	Admis-sions	Number Units	Number Oper Beds	#Beds Per Unit
CARDIAC CARE UNIT	_____	_____	_____	_____	_____
MEDICAL ICU	_____	_____	_____	_____	_____
SURGICAL ICU	_____	_____	_____	_____	_____
OTHER ICU'S	_____	_____	_____	_____	_____
LIGHT CARE UNIT	_____	_____	_____	_____	_____
MED/SURG UNIT	_____	_____	_____	_____	_____
OBSTETRICAL UNIT	_____	_____	_____	_____	_____
NEONATAL ICU	_____	_____	_____	_____	_____
PEDIATRIC UNIT	_____	_____	_____	_____	_____
PSYCHIATRIC UNIT	_____	_____	_____	_____	_____
DETOX UNIT	_____	_____	_____	_____	_____
ALCOHOL REHAB UNIT	_____	_____	_____	_____	_____
TOTAL:	_____	_____	_____	_____	_____

Figure A-2: Sample page from "Medical MILCON Hospital Questionnaire"[14]

sends a form to the base engineers requesting the project. The base engineers, with the assistance of the Regional Health Facilities Office, then prepare a form known as DD Form 1391, Military Construction Project Data. The 1391 describes and justifies medical projects to all levels of the military service, the Office of the Secretary of Defense, the Office of Management and Budget, and Congress.[5] This is the key document that is used to justify the service's request for the size of the project and the amount of money. Once the 1391 is complete, it is forwarded up the chain of command. At each level in the chain, projects are prioritized. This continues right up to the DMFO, which takes the lists of all the services and prioritizes the projects from the standpoint of overall delivery of DoD healthcare.

The immediate goal of the 1391 submission is to get the project included in the Future Year Defense Plan (FYDP). The FYDP is a six year plan of all the medical projects that the services intend to accomplish. In any given year, the FYDP being assembled is for the period beginning two years beyond the current year. Figure A-1 indicates that our project must be submitted by October 1987 (FY88) to be included in the next FYDP. The FYDP being assembled would be for FY90 through FY95. Since projects from the previous FYDP still occupy FY90 through FY94, new projects generally are slated for the final year of the FYDP. So even though everything was submitted on time and in accordance with the project schedule, the project we identified in 1986 or 1987 won't even start until October 1994 at the earliest.

The DMFO meanwhile conducts their own planning. For some projects, as required by public law, the DMFO directs that an economic analysis be performed, which

is accomplished by a civilian firm under contract. For these projects, the results of the economic analysis are considered in the planning of the project. Figure A-1 shows that if our project required an economic analysis, it would be accomplished during 1990. The DMFO assesses the eligible population's healthcare needs, studies alternative sources and associated costs for care, and develops the projects to support the delivery of health care.[6]

All projects also require an environmental assessment, and if there are any significant impacts, an Environmental Impact Statement is also required. This can be a lengthy process in and of itself.

Once a project is in the program, a project planning package is developed to support the project. This package includes the latest 1391 (if it has been revised), a project narrative, the program for design, and a room-by-room equipment list. These documents are generally prepared by the Health Facilities Officers (HFOs) of each service, and sent to the DMFO for review and any revisions which are deemed necessary. Figure A-1 shows the preparation of the project proposal beginning in August 1991, however, work on this and the other supporting documents probably had been going on since the project was included in the FYDP.

The DMFO is responsible for presenting and defending the proposed program to Congress. Once approved, the next step is for the using service to request a design instruction be issued. Thus, the process moves from the planning to the design stage.

[1] Defense Medical Facilities Office, Planning, Programming, Budgeting, and Project Execution Guidance for the Defense Medical Military Construction Program (Office of the Assistant Secretary of Defense (Health Affairs), 15 May 1988), 3.

[2] Air Force Health Facilities Division, Adventures In Training (Air Force Medical Support Agency, Brooks AFB, Texas, 10 April 1992), 9B.

[3] Air Force Health Facilities Division-Programs Branch, Air Force Health Facilities Division Guide to DD Form 1391 Preparation for Medical Military Construction Projects (HQ USAF/SGSFW, Bolling AFB, DC, 24 April 1992), B2.

[4] Defense Medical Facilities Office, Medical MILCON Hospital Questionnaire (Office of the Assistant Secretary of Defense(Health Affairs), September 1988), 23.

[5] Air Force Health Facilities Division-Programs Branch, II.

[6] Defense Medical Facilities Office, Planning, Programming, Budgeting, and Project Execution Guidance for the Defense Medical Military Construction Program, 5.

APPENDIX B

MCP PROJECT TIME LINE

1. This model timeline has been developed to schedule the planning, design and construction actions for a medical project in the military Construction Program (MCP). The intent of this timeline is to identify the appropriate periods of time required to complete these actions within the established time frame for providing project information to OASD(HA) and the Congress of the United States. This timeline has been developed using a FY 89 MCP project as an example.

2. Listed below are totals for the times required for planning, design and construction actions as developed in the model.

Planning Actions:	9 July 84 to 9 Dec 85		74 Weeks
Design Actions:			
Phase I	A-E Acquisition	- 16 Dec 85 to 28 Jul 86	32 Weeks
Phase II	Concept Design	- 4 Aug 86 to 15 Sep 87	58 Weeks
Phase III	Construction Documents	- 14 Oct 87 to 27 Sep 88	50 Weeks
Construction Actions:			
Pre-Construction		- 15 Oct 88 to 21 May 88	31 Weeks
Construction		(time dependent on size and complexity of project)	

3. There are two critical action dates in the timeline:

**4 Nov 85 - Submittal of MCP Project Proposal to OASD(HA) should be accomplished by this date to allow sufficient time for development of concept design.

** 15 Jun 87 - Submittal of concept design and cost estimate to OASD(HA) should accomplished by this date to allow sufficient time to complete development of construction documents.

Prepared By:
Facilities Division
Air Force Office of Medical Support
Office of the Surgeon General, USAF

31 Jan 86

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PLANNING ACTIONS

Activity	OPR	TIME REQ	START DATE
Economic Analysis (EA) Contract Activities			
Submit Scope of Work (SOW) & Funding Authority (Form 9)	SGSFX	3 weeks	9 Jul 84
SOW Review by Contracting Office	Contracting	2 weeks	30 Jul 84
Prepare CBD Announcement	Contracting	1 week	13 Aug 84
Publish CBD Announcement	Contracting	2 weeks	20 Aug 84
Close of CBD Announcement	Contracting	4 weeks	4 Sep 84
Mailout of Request for Proposal (RFP)	Contracting	1 week	1 Oct 84
	TOTAL	13 weeks	
Proposal Submissions by Firms	Contracting	4 weeks	9 Oct 84
Convene Contract Selection Board	SGSFX	3 weeks	7 Nov 84
Formal Contract Legal Review	Contracting	2 weeks	26 Nov 84
Contract Award	Contracting	1 week	10 Dec 84
	TOTAL	10 weeks	
Economic Analysis (EA) Activities			
EA Kick-off Meeting (Bolling AFB)	SGSFX	3 weeks	17 Dec 84
Facility Site Visit	SGSFX	2 weeks	7 Jan 85
Data Evaluation/On-Board Meeting	Contractor	13 weeks	21 Jan 85
Draft Report Submittal	Contractor	4 weeks	22 Apr 85
Review & Consolidation of Comments to Contractor	SGSF	4 weeks	20 May 85.
Preparation of Final EA Report	Contractor	5 weeks	17 Jun 85
Contractor Briefing of Final Report (Bolling AFB)	Contractor	2 weeks	22 Jul 85
	TOTAL	33 weeks	
Project Proposal (PP) Development and Submission			
Prepare Format 8	SGSFX	4 weeks	5 Aug 85
Prepare Program for Design	SGSFX	4 weeks	5 Aug 85
Informal Air Staff Coordination (SGP, SGHM, SGHA)	SGSFX	4 weeks	2 Sep 85
Submission of PP to Air Staff & SAF/MI	SGSFW	4 weeks	7 Oct 85
PP to OASD(HA) for review/site visit	SGSFX	4 weeks	4 Nov 85**
OASD(HA) Approval Memo Receipt	OASD(HA)	1 week	2 Dec 85
Request for Design Instruction Submitted	SGSFX	1 week	9 Dec 85
	TOTAL	18 weeks	

DESIGN ACTIONS

PHASE I

Activity	OPR	TIME REQ	START DATE
Initiation of Design			
Prepare Equipment List	HFO/SGSFD	4 weeks	4 Nov 85
Prepare Design Narrative	HFO/SGSFD	2 weeks	2 Dec 85
Coordinate DI	AF/MFDO	4 weeks	16 Dec 85
Issue DI in PDC	AF/MFDO	4 weeks	16 Dec 85
Prepare "Field" DI	AF/MFDO	4 weeks	16 Dec 85
2807 Action (Notification to Congress)	AF/MFDO	4 weeks	16 Dec 85
	TOTAL	10 weeks	
A-E Selection/Negotiation			
Prepare CBD Announcement	Design Agent (DA)/MFDO	2 weeks	21 Jan 86
Mail Announcement to CBD	District	1 week	3 Feb 86
Publish CBD Announcement	CBD	1 week	10 Feb 86
Close CBD Announcement	CBD	4 weeks	18 Feb 86
A-E Preselection Board (Prepare Select)	District	2 weeks	18 Mar 86
Preselection Approval	District	1 week	31 Mar 86
A-E Selection Board - Final	DA/MFDO	1 week	7 Apr 86
Complete Final A-E Selection Minutes	DA/MFDO	1 week	14 Apr 86
Request Selection Approval	DA/MFDO	1 week	21 Apr 86
Final A-E Selection Approval	DA	1 week	28 Apr 86
Prenegotiation Conference	DA/MFDO	2 weeks	5 May 86
Prenegotiation Site Visit	MFDO/District	2 weeks	5 May 86
Request Proposal From A-E	District	2 weeks	19 May 86
A-E Submits Proposal	District	2 weeks	2 Jun 86
ECAA Audit of A-E	ECAA	6 weeks	16 Jun 86
Negotiate Contract W/A-E	District	1 week	14 Jul 86
A-E Finalize Proposal	District	1 week	21 Jul 86
Contract Approval	Division	1 week	28 Jul 86
	TOTAL	30 weeks	

DESIGN ACTIONS

PHASE II

Activity	OPR	TIME REQ	START DATE
Start Concept Design	Design Agent (DA)	1 week	4 Aug 86
(Design Meeting As Required)	MFDO		
On-Board w/A-E	SGSFD	1 week	TBD
First Submittal (4 weeks from NTP)	A-E		2 Sep 86
Repro + Mail Time	A-E	1 week	
First Submittal Review (Coordinate w/HFO & Consultants)	SGSFD/MFDO	2 weeks	8 Sep 86
First Submittal Review Conf (SRC)	DA/MFDO	2 days	2 Oct 86
On-Board w/A-E	SGSFD		TBD at Review
Second Submittal (6 weeks from SRC)	A-E		17 Nov 86
Repro + Mail Time	A-E	1 week	
Second Submittal Review (Coordinate w/HFO & Consultants)	SGSFD/MFDO	3 weeks	24 Nov 86
Second Submittal Review Conf	DA/MFDO	2 days	17 Dec 86
Submit/Handcarry to OASD(HA)	SGSFD/MFDO	1 day	19 Dec 86
OASD(HA) Approval	OASD(HA)	1 week	8 Jan 86
Notice to Proceed to 3rd Concept (NTP)	MFDO/DA	1 week	12 Jan 86
On-Board w/A-E	SGSFD		TBD at Review
Third Submittal (10 weeks from NTP)	A-E		23 Mar 87
Repro + Mail Time		1 week	
Third Submittal Review	SGSFD/MFDO	4 weeks	30 Mar 87
(Equip Lay-In Review, coordinate w/HFO)	HFO		30 Mar 87
	SGSFD		13 Apr 87
Third Submittal Review Conf (SRC)	DA/MFDO	1 week	29 Apr 87
Fourth (Concept) Submittal (3 weeks from SRC)	A-E		26 May 87
Repro + Mail Time		1 week	
Concept Submittal to AF	SGSFD/MFDO	2 weeks	1 Jun 87
Concept Submittal to OASD(HA)	SGSFD	4 weeks	15 Jun 87**
OASD(HA) Concept Approval	OASD(HA)	2 weeks	15 Sep 87
NTP to Working Drawings	DA/MFDO	2 weeks	5 Oct 87

DESIGN ACTIONS

PHASE III

Activity	OPR	TIME REQ	START DATE
Begin Working Drawings			
Notice to Proceed	LEE/MFDO	1 week	14 Oct 87
40% Equipment/Communications Review	AFRCE/HFO	1 week*	O/A 8 Dec 87
60% Submittal (16 weeks from NTP)	A-E		1 Feb 88
Repro + Mail Time		1 week	
60% Review	AFRCE/HFO Design Agent(DA)	4 weeks	8 Feb 88
60% Review Comment Conf (RCC)	AFRCE/HFO DA/A-E	1 week	10 Mar 88
90% Submittal (10 weeks from 60% RCC)	A-E		24 May 88
Repro + Mail Time		1 week	
90% Review	AFRCE/HFO DA	4 weeks	31 May 88
90% Review Comment Conf (RCC)	AFRCE/HFO DA/A-E	1 week	29 Jun 88
100% Submittal (4 weeks from 90% RCC)	A-E		2 Aug 88
Repro + Mail Time		1 week	
100% Back Check Review	AFRCE/HFO DA/A-E	2 weeks	9 Aug 88
100% Review Comment Conf (RCC)	AFRCE/HFO DA/A-E	1 week	26 Aug 88
Prepare Final Drawings/Specs	A-E	4 weeks	30 Aug 88
Mail to Design Agent	A-E	1 week	27 Sep 88

*Time required dependent on size and complexity of project.

CONSTRUCTION ACTIONS

Activity	OPR	TIME REQ	START DATE
Advertise for Contractors (CBD)	Design Agent (DA)	4 weeks	15 Oct 88
Reproduce drawings and specs for Bid Period	DA	4 weeks*	15 Oct 88
Open Bids (Validate)	DA	8 weeks*	15 Nov 88
Procurement of Funds	DA	1 week	15 Jan 89
Award Contract	DA/AFRCE	8 weeks	21 Jan 89
Notice to Proceed (NTP)	DA	2 weeks	21 Mar 89
Pre-construction Meeting	Construction Agent	2 days	7 Apr 89
Ground-Breaking	Construction Agent	2 days	21 Apr 89
Construction Period	All	1 day	21 May 89
Final Inspection	All	1-4 years*	21 May 89
Handover	All	-	
Beneficial Occupancy	SG	-	
Post Occupancy Evaluation	HFO	1 year after Beneficial Occupancy Date	

*Time required dependent on size and complexity of project.

APPENDIX C

Construction Management Services[1]

DESIGN PHASE

1. He advises, assists, and makes recommendations to the owner and A-E on all aspects of the project schedule requirements, completion priorities, and other scheduling information. He performs feasibility studies.

2. He develops a work plan that sets forth in detail the recommended approach to the project, including *(a)* overall approach; *(b)* home-office services; *(c)* field management services; *(d)* use of proposed work packages; *(e)* list of proposed contractors for further servicing; *(f)* preliminary design and procurement schedules; *(g)* value engineering program, and *(h)* life-cycle construction analysis program. He also designs the information flow channels.

3. He reviews the architectural and engineering plans and specifications for the purpose of advising on such factors as construction feasibility, possible economies, availability of materials and labor, time requirements for procurement and construction, projected costs, and life-cycle costs. He assists in the coordination of all sections of the drawings without assuming any of the A-E's normal responsibilities for design. He has the right to control design because it is his responsibility that the project be finished on time and within budget. He also conducts value engineering analysis, time-cost trade-offs of alternative designs, and assists in systems analysis.

4. He prepares cost evaluations and budget estimates based on a quantity survey of the plans and specifications at the preliminary stage of development. These estimates are revised and refined as development of plans and specifications proceeds. The CM advises the owner and the A-E if it appears that the budgeted target for the project cost or completion schedule will not be met. On many projects the CM will be required by the owner to provide a guaranteed maximum price at the time in which the construction team has developed the drawings and specifications to a point where the scope of the project can be clearly defined.

5. He recommends for early purchase and expedites the procurement of long-lead items to ensure their delivery by the required dates.

6. He advises on the prepackaging of bidding documents for the awarding of separate construction contracts to the various systems and trades. Such advice includes the sequence of document preparation to facilitate phased construction work during completion of the design development.

7. He analyzes and recommends to the owner and the A-E the type and scope of work represented by each bid package in relation to time required for performance, availability of labor and materials, community relations, overlapping trade jurisdictions, provisions for temporary facilities, and so forth, and participates in scheduling both design and construction procedures.

8. He works some of the design operations into an overall CPM or other network scheduling operation when schedule criteria of design and construction emerge.

9. He conducts prebid conferences among contractors, subcontractors, and manufacturers of systems and subsystems to ensure that each bidder understands the components of the bidding documents and the management techniques to be applied, including any computerized intercommunications network scheduling and cash-flow controls.

10. He takes competitive bids for construction when working drawings and specifications are completed. He leads in the analysis of bids received and either awards the contracts or recommends to the owner that such contracts be awarded. The CM's contract with the owner dictates the procedure for the contract awards.

11. He prepares a progress schedule using CPM or other scheduling techniques for all project activities by the owner, A-E, trade contractors, and himself early in the project. Incorporated into this schedule are all aspects of the construction process, that is, design, bidding, procurement, and construction. He then monitors this master schedule during both the design and construction phases. He is responsible for providing all parties with periodic status reports on the work with respect to the project schedule. He also sees to it that the entire construction process is optimized in terms of cost and time.

CONSTRUCTION PHASE

1. He maintains a competent full-time supervisory staff at the jobsite to coordinate and provide general direction of the work and progress of the trade contractors on the project.

2. On a day-to-day basis, he inspects the work being performed to ensure that the materials furnished and the work performed are in accordance with the quality required by the working drawings and specifications. He also conducts factory inspections as required.

3. He works to facilitate on-site communication, defining lines of authority and procedures to assure coordination among the owner, A-E, contractors, and his own team.

4. He continuously gathers data on vendors and materials delivery dates to ensure that needed materials are available when and as required. He meshes the design-drawing activity with the procurement-contracting activity.

5. In cooperation with the A-E, he establishes and implements procedures for expediting and processing all shop drawings, catalogs, and other project papers.

6. Acting as a "troubleshooter," the CM's functions are to maintain the information flow and compare results in terms of time and cost against projection so that bottlenecks and overruns can be anticipated and avoided. These functions require constant on-site vigilance.

7. He is responsible for the establishment of effective programs related to safety, jobsite records, labor relations, public relations, equal employment opportunities (EEO), and progress reports.

8. He reviews and processes all applications for payment by trade contractors and material suppliers concerned in accordance with the terms of the contract.

9. He negotiates change orders with contractors, maintains records of these change orders and their effects on schedules, and establishes back charges.

10. Either with his own forces or others, he furnishes all general condition items if required. If requested, he performs portions of the work with his own forces.

11. He schedules and conducts job meetings to ensure that the project is progressing in an orderly fashion.

12. He provides data processing services if requested by the owner.

13. He confers with architects and engineers when clarification or interpretation of documents becomes necessary.

14. Sometime before the completion of the project, he sets up a joint inspection to be made by contractors, project manager, owner, architect-engineer, and other interested parties. This inspection as well as the final inspection must be followed by decisions on the part of all concerned as to the most economical and expeditious ways of handling a "punch list" of incomplete items. He also coordinates start-up programs.

[1] Kwaku A. Tenah, The Construction Management Process (Reston, VA: Prentice-Hall, Inc., 1985), 31-34.

APPENDIX D

SUMMARIZED REQUIREMENTS OF THE FEDERAL ACQUISITION REGULATION (FAR) AND THE DEPARTMENT OF DEFENSE FAR SUPPLEMENT (DFARS)

Federal Acquisition Regulation

Section	Requirement
1.402	Unless precluded by law, executive order, or regulation, deviations from the FAR may be granted as specified in this subpart when necessary to meet the specific needs and requirements of each agency. The development and testing of new techniques and methods of acquisition should not be stifled simply because such action would require a FAR deviation. The fact that deviation authority is required should not, of itself, deter agencies in their development and testing of new techniques and acquisition methods.
6.101	(a) 10 U.S.C. 2304 and 41 U.S.C 253 require, with certain exceptions, that contracting officers shall promote and provide for full and open competition in soliciting offers and awarding government contracts. (b) Contracting officers shall provide for full and open competition through use of the competitive procedure or combination of competitive procedures contained in this subpart that is best suited to the circumstances of the contract action. Contracting officers must use good judgment in selecting the procedure that best meets the needs of the government.

6.401

(a) *Sealed Bids.* Contracting Officers shall solicit sealed bids if-

(1) Time permits the solicitation, submission, and evaluation of sealed bids;
(2) The award will be made on the basis of price and other price-related factors;
(3) It is not necessary to conduct discussions with the responding offerors about their bids; and
(4) There is reasonable expectation of receiving more than one sealed bid.

(b) *Competitive Proposals.*

(1) Contracting officers may request competitive proposals if sealed bids are not appropriate under paragraph (a) above.
(2) Because of differences in areas such as law, regulations, and business practices, it is generally necessary to conduct discussions with offerors relative to proposed contracts to be made and performed outside the United States, its possessions, or Puerto Rico. Competitive proposals will therefore be used for these contracts unless discussions are not required and the use of sealed bids is otherwise appropriate.

9.103

(a) Purchases shall be made from, and contracts shall be awarded to, responsible prospective contractors only.

(b) No purchase or award shall be made unless the contracting officer makes an affirmative determination of responsibility. In the absence of information clearly indicating that the prospective contractor is responsible, the contracting officer shall make a determination of nonresponsibility.

(c) The award of a contract to a supplier based on lowest evaluated price alone can be false economy if there is subsequent default, late deliveries, or other unsatisfactory performance resulting in additional contractual or administrative costs. While it is important that Government purchases be made at the lowest price, this does not require an award to a supplier solely because that supplier submits the lowest offer. A prospective contractor must affirmatively demonstrate its responsibility, including, when necessary, the responsibility of its proposed subcontractors.

14.407-1(a)	The contracting officer shall make a contract award . . . to that responsible bidder whose bid, conforming to the invitation, will be most advantageous to the Government, considering only price and the price-related factors included in the invitation.
14.407-2(a)	The contracting officer shall determine that a prospective contractor is responsible and that the prices offered are reasonable before awarding the contract.
16.101(a)	A wide selection of contract types is available to the government and contractors in order to provide needed flexibility in acquiring the large variety and volume of supplies and services required by agencies.
16.103	(a) Selecting the contract type is generally a matter for negotiation and requires the exercise of sound judgment. (b) A firm-fixed-price contract, which best utilizes the basic profit motive of business enterprise, shall be used when the risk involved is minimal or can be predicted with an acceptable degree of certainty. However, when a reasonable basis for firm pricing does not exist, other contract types should be considered, and negotiations should be directed toward selecting a contract type (or combination of types) that will appropriately tie profit to contractor performance.
16.301-1	[Cost reimbursement contracts] establish an estimate of total cost for the purpose of obligating funds and establishing a ceiling that the contractor may not exceed (except at its own risk) without the approval of the contracting officer.
16.301-2	Cost-reimbursement contracts are suitable for use only when uncertainties involved in contract performance do not permit costs to be estimated with sufficient accuracy to use any type of fixed-price contract.

16.301-3 A cost-reimbursement contract may be used only when-

(a) The contractor's accounting system is adequate for determining costs applicable to the contract; and

(b) Appropriate Government surveillance during performance will provide reasonable assurance that efficient methods and effective cost controls are used.

36.103 (a) Contracting officers shall acquire construction using sealed bid procedures if the conditions of 6.401(a) apply, except that sealed bidding need not be used for construction contracts to be performed outside the United States, its possessions, or Puerto Rico. (See 6.401(b)(2).)

(b) Contracting officers shall acquire architect-engineer services by negotiation, and select sources in accordance with applicable law, Subpart 36.6, and agency regulations.

36.207(a) Generally, firm-fixed-price contracts shall be used to acquire construction. They may be priced (1) on a lump-sum basis (when a lump sum is paid for the total work), (2) on a unit-price basis (when a unit price is paid for a specified quantity of work units), or (3) using a combination of the two methods.

36.209 No contract for the construction of a project shall be awarded to the firm that designed the project or its subsidiaries or affiliates, except with the approval of the head of the agency or authorized representative.

36.403 Contracting officers may use a cost-reimbursement contract to acquire construction only when its use is consistent with Subpart 16.3 and Part 15.

36.601-1 The Government shall publicly announce all requirements for architect-engineer services and negotiate contracts for these services based on the demonstrated competence and qualifications of prospective contractors to perform the services at fair and reasonable prices.

36.602-1(a) Agencies shall evaluate each potential contractor in terms of its-

(1) Professional qualifications necessary for satisfactory performance of required services;
(2) Specialized experience and technical competence in the type of work required;
(3) Capacity to accomplish the work in the required time;
(4) Past performance on contracts with government agencies and private industry in terms of cost control, quality of work, and compliance with performance schedules;
(5) Location in the general geographical area of the project and knowledge of the locality of the project; *provided*, that application of this criterion leaves an appropriate number of qualified firms, given the nature and size of the project; and
(6) Acceptability under other appropriate evaluation criteria.

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Section	Requirement
236.271	Annual military construction appropriations acts restrict the use of cost-plus-fixed-fee contracts for construction and A-E services. The Assistant Secretary of Defense (Production and Logistics) must specifically approve such contracts in writing when- (a) They are estimated to exceed $25,000; (b) They will be performed within the U.S., except Alaska; and (c) They are funded by a military construction appropriation act.
236.272(a)	Prequalification procedures may be used when necessary to ensure timely and efficient performance of critical construction projects. Prequalification- (1) Results in a list of sources determined to be qualified to perform a specific construction contract; and (2) Limits offerors to those with proven competence to perform in the required manner.
236.602-1(6)	The primary factor in A/E selection is the determination of the most highly qualified firm. Also consider secondary factors such as geographic proximity and equitable distribution of the work, but do not attribute greater significance to the secondary factors than to qualifications and past performance. Do not reject the overall most highly qualified firm solely in the interest of equitable distribution of contracts.
236.606-70(a)	10 U.S.C. 4520, 7212, and 9540 limit the contract price (or fee) for A-E services for the preparation of designs, plans, drawings, and specifications to six percent of the project's estimated construction cost.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and in quality, as a report for the degree of Master of Building Construction.

Felix T. Uhlik, Chair
Professor of Building Construction

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and in quality, as a report for the degree of Master of Building Construction.

Robert F. Cox
Professor of Building Construction

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and in quality, as a report for the degree of Master of Building Construction.

R. Paul Duncan
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This report was submitted to the graduate faculty of the M.E. Rinker, Sr., School of Building Construction and was accepted as partial fulfillment of the requirements for the degree of Master of Building Construction.

May 1996

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